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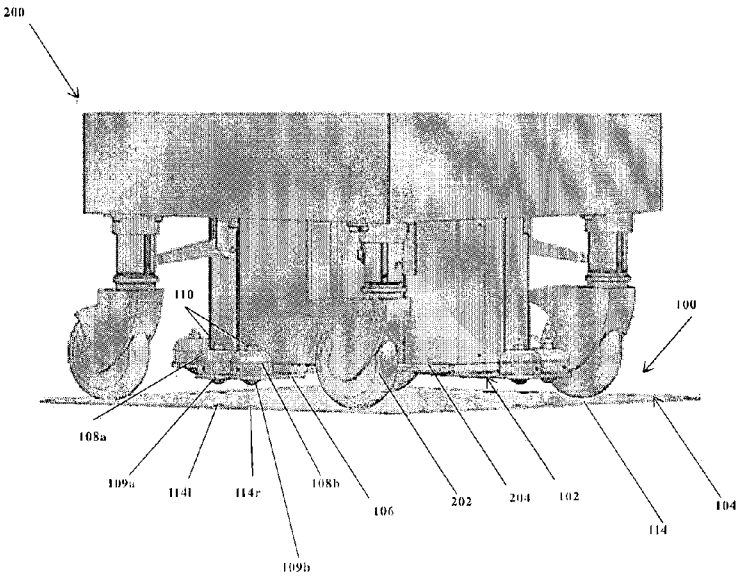
(54) **Title**: SYSTEM AND METHOD FOR DOCKING A DEVICE WITH RESPECT TO A TARGET DEVICE



(57) **Abstract**: A system for docking a medical device with respect to a Computer Tomography scanner table. The system includes a first part having a right side sphere and a left side sphere attached to the medical device and a second part having at least one of right floor plate and left floor plate secured to floor in the right side of the Computer Tomography scanner table and the left side of the Computer Tomography scanner table respectively. The right side sphere includes a first diameter, the right floor plate includes plurality of locating hole having a second diameter configured to receive the right side sphere and plurality of relief hole having a third diameter configured to receive the left side sphere. The first diameter is more than the second diameter and the third diameter is more than the first diameter.

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SYSTEM AND METHOD FOR DOCKING A DEVICE WITH RESPECT TO A TARGET DEVICE

FIELD OF INVENTION

[001] The embodiments herein relate to a docking mechanism, and more particularly but not exclusively to a docking mechanism and a method for providing the docking mechanism that could be configured for positioning and aligning a device with respect to a target device.

BACKGROUND OF INVENTION

[002] Positioning and aligning a device accurately with respect to a target device is given a significant importance in industries such as medical industry. In medical industry, various medical procedures such as biopsy, surgery and so on requires proper positioning and alignment of two or more devices in order to achieve desired accuracy in medical procedures. For example, in Computer Tomography (CT) guided medical procedures, a need exists to align/dock/position a medical device such as a robotic device, accurately and repeatedly with reference to a CT scanner. The device (robot) may be for biopsy, surgery, oblation, drug delivery or any other medical procedure. Accurate alignment of the device (robot) is essential to do a CT guided procedure. In CT guided procedure, the CT image is processed and from the image information, the coordinates are derived to drive the Robot to an exact location for example the location of a tumor.

[003] Further, the accuracy of the entire procedure is directly related to the accuracy with which the robotic device is positioned and aligned with respect to the CT scanner (CT scanner table). At present, in order to dock the medical device with respect to the CT scanner, an optical/digital solution is used. In optical/digital solution, plurality of camera are mounted on to the medical device. The cameras are configured to capture a pattern pasted on to the floor. Further, a controller provided in communication with the camera is configured to determine the deviation of the medical device with respect to the calibrated position by using image processing technique. Furthermore, the information based on the deviation of medical device with respect to the calibrated position is fed to a computer. The computer is configured to correct the positioning coordinates of the medical device based on the determined deviation. Deviations from the vertical axis are also measured and fed manually to the computed and correction is performed.

[004] However, the optical/digital solution does not achieve the optimum accuracy and does not take care of major deviations in the floor and CT table inclination. It is complicated and needs a skilled person to input the values and works only within a narrow range. Also repeatability is not satisfactory.

[005] Another method for docking the medical device with respect to CT scanner is to use a docking aid/slot mounted on the floor. The robotic device will have a mating part which will mate with the docking aid on the floor. The process of providing a docking aid/slot requires the docking aid to be drilled and mounted on the floor. This arrangement interferes with the free movement of patient and stretcher around the CT table. Also hospitals are not permitting drilling the floor in the CT room. Hence, the conventional docking mechanisms are partially inefficient in aligning/docking/positioning a medical device (such as a robotic device); accurately and repeatedly with reference to a CT scanner thereby making the CT guided medical procedure partially inefficient

[006] In conventional docking mechanism as discussed above (optical/digital solution and docking aid/slot mounted on the floor) enables the robotic device to be docked and aligned either to the left or right side of the CT table. However, various medical procedures require the robotic device to be fixed on both side of the CT table. Therefore, the conventional docking mechanism is partially in efficient in the medical procedures that require robotic medical device to be fixed on both side of the CT table.

[007] Therefore, there is a need for a system and method for docking the medical device to a user desired position (both side of the CT scanner table). Further, there is a need for a system and method for docking the medical device that could maintain the accuracy during repeated usage. Further, there is a need for a system and method for docking the medical device that could adjust the positioning of medical device according to the inclinations in the floor and the CT table. Furthermore, there is a need for a docking mechanism that could obviate above mentioned drawbacks associated with the conventional docking mechanism.

OBJECT OF INVENTION

[008] The principal object of this invention is to provide a system and method for docking a medical device to user desired position (both side of a CT scanner table).

[009] Another object of the invention is to provide a system and method for docking the medical device that could maintain the accuracy during repeated usage.

[0010] A further object of the invention is to provide a system and method for docking a medical device that could adjust the positioning of medical device according to the inclinations in the floor and the CT table.

[0011] Yet another object of the invention is to provide a docking mechanism that is simple and cost effective.

[0012] Another object of the invention is to provide a docking mechanism for medical device that does not include any three dimensional aid such that it could enable free movement of patient stretcher.

[0013] Another object of the invention is to provide a docking mechanism that could reduce the time involved in the docking process.

[0014] These and other objects of the embodiments herein will be better appreciated and understood when considered in conjunction with the following description and the accompanying drawings. It should be understood, however, that the following descriptions, while indicating preferred embodiments and numerous specific details thereof, are given by way of illustration and not of limitation. Many changes and modifications may be made within the scope of the embodiments herein without departing from the spirit thereof, and the embodiments herein include all such modifications.

BRIEF DESCRIPTION OF FIGURES

[0015] This invention is illustrated in the accompanying drawings, throughout which like reference letters indicate corresponding parts in the various figures. The embodiments herein will be better understood from the following description with reference to the drawings, in which:

[0016] FIG. 1 depicts a docking mechanism attached to the medical device according to embodiments as disclosed herein;

[0017] FIG. 2 depicts a right floor plate according to an embodiment disclosed herein;

[0018] FIG. 3 depicts a left floor plate according to an embodiment disclosed herein; and

[0019] Fig. 4 depicts a medical device that is docked using a docking mechanism according to an embodiment of the present invention;

[0020] Fig. 5 depicts a plate provided in the first part according to an embodiment of the present invention;

[0021] Fig. 6 depicts a docked position of the docking mechanism with plunger switch according to another embodiment of the present invention;

[0022] Fig. 7 depict an undocked position of the docking mechanism with plunger switch according to another embodiment of the present invention;

[0023] Fig. 8a and 8b depict a right floor plate and a left floor plate respectively according to another embodiment of the present invention; and

[0024] Fig. 9 is a flow chart depicting the method for docking a medical device 200 such as a robotic device corresponding to the CT scanner table according to an embodiment disclosed herein.

DETAILED DESCRIPTION OF INVENTION

[0025] The embodiments herein and the various features and advantageous details thereof are explained more fully with reference to the non-limiting embodiments that are illustrated in the accompanying drawings and detailed in the following description. Descriptions of well-known components and processing techniques are omitted so as to not unnecessarily obscure the embodiments herein. The examples used herein are intended merely to facilitate an understanding of ways in which the embodiments herein may be practiced and to further enable those of skill in the art to practice the embodiments herein. For example, although, while some embodiments are explained with respect to docking a robotic medical device with respect to a Computer Tomography (CT) scanner table for the ease of describing, it should be noted that any other device that requires to be . may also incorporate the subject matter of the invention with little or no modifications. Accordingly, the examples should not be construed as limiting the scope of the embodiments herein.

[0026] The embodiments herein achieve a system and method for docking a medical device to both side of a CT scanner table as described herein below. Further, the embodiments herein achieve a system and method for docking the medical device that could maintain the accuracy during repeated usage. Further, the embodiments herein achieve a system and method for docking a medical device that could adjust the positioning of medical device according to the inclinations in the floor and the CT table. Furthermore, the embodiments herein achieve provide a docking mechanism that is simple and cost effective. Referring now to the drawings, and more particularly to FIGS. 1 through 9, where similar reference characters denote corresponding features consistently throughout the figures, there are shown embodiments.

[0027] **FIG. 1** depicts a docking mechanism attached to the medical device according to embodiments as disclosed herein. The docking mechanism 100 includes a first part 102 and a second part 104. The first part 102 is provided in communication with a device that has to be docked. In an embodiment, the first part 102 is provided in communication with a medical device 200. The second part 104 is provided in communication with a target surface on which the device has to be docked. In an embodiment, the target surface is a floor. The medical device 200 includes wheels 202. In an embodiment, the wheels 202 are retractable. The retractable wheels enable the medical device 200 to rest on its base such that the medical device 200 could stand on wheels 202 or on a solid metal base 203.

[0028] The first part 102 includes plurality of plates, each having plurality of ball housing. The plurality of plates is provided at each side of the medical device 200. Further, each of ball

housing includes at least one sphere that could be configured to dock the device 200. In an embodiment, the first part 102 includes four plates 106, each plate having two ball housings 108a and 108b. The four plates 106 are provided at each side of the medical device 200, such that each side of the medical device 200 includes two ball housings 108a and 108b. In an embodiment, the ball housings 108a and 108b includes a sphere 109a and a sphere 109b respectively, such that a medical device 200 having four sides could include eight spheres (two sets of spheres (109a and 109b) in each side). In an embodiment, the plate 106, the housings (108a and 108b) and the sphere (109a and 109b) are all made of rigid material such as steel. However, it is also within the scope of invention, that the plate 106, the housings (108a and 108b) and the sphere (109a and 109b) could be made of any other material without otherwise deterring intended function of the docking mechanism 100 as can be deduced from this description. In an embodiment, the sphere 109a is configured to dock the medical device 200 to the right side of the CT scanner table. Further, the sphere 109b is configured to dock the medical device 200 to the left side of the CT scanner table. In another embodiment, the sphere 109a and sphere 109b are provided with separate marks, such that the sphere 109a and 109b could be differentiated. In an embodiment, the sphere 109a and the sphere 109b is colored coded in order to differentiate each other. Fig. 5 depicts a plate provided in the first part according to an embodiment of the present invention.

[0029] The first part 102 further includes a leveling bolt 110. In an embodiment, the leveling bolt 110 is provided on top of each housing 108a and 108b. However, it is also within the scope of invention, that the leveling bolt 110 could be provided in any other position without otherwise deterring intended function of the docking mechanism 100 as can be deduced from this description. In an embodiment, the leveling bolt 110 is selected from a jack bolt. The leveling bolt 110 is configured to adjust the inclination of device 200 to corresponding to the orientation of CT scanner table (not shown). In another embodiment, the leveling bolt 110 is provided with a nut 112 to permanently lock the inclination of the device 200.

[0030] The second part 104 includes at least one of a right floor plate 114 and a left floor plate 116. The right floor plate 114 is configured to dock the medical device 200 to the right side of the CT scanner table. The left floor plate 116 is configured to dock the medical device 200 to the left side of the CT scanner table. The right floor plate 114 includes at least one locating hole 1141, at least one relief-hole 114r, at least one pattern for camera detection 114p. The locating hole 1141 is provided corresponding to the sphere 109a that is configured to dock the medical device 200 to the right side of the CT scanner table. Further, the locating hole 1141 is configured to receive the

sphere 109a. In an embodiment, the sphere 109a is provided having a diameter slightly higher than the diameter of the locating hole 114l, such that the locating hole 114l could be configured to receive the sphere 109a up to a certain depth. In one embodiment, the sphere 109a includes a diameter of 14mm and the locating hole 114l includes a diameter of 12mm. The locating hole 114l further enables aligning the sphere 109a, such that the center of sphere 109a and the center of locating hole 114l lies along the same axis. In an embodiment, the locating hole 114l is provided as a through hole. In another embodiment, the locating hole 114l is provided as a semi through or non through hole without otherwise deterring intended function of the docking mechanism as could be deduced from this description.

[0031] The relief hole 114r is provided corresponding to the sphere 109b that is configured to dock the medical device 200 to the left side of the CT scanner table. The relief hole 114r is configured to allow the sphere 109b to pass through it, such that the outer surface of the sphere 109b does not contact the inner surface of the relief hole 114r. In an embodiment, the relief hole 114r is provided having a diameter considerably higher than the diameter of sphere 109b, such that the outer surface of the sphere 109b does not contact the inner surface of the relief hole 114r. In an embodiment, the sphere 109b includes a diameter of 14mm and the relief hole 114r includes a diameter of 18mm. In an embodiment, the relief hole 114r is provided as a through hole. In another embodiment, the relief hole 114r is provided as a semi through or non through hole such that the outer surface of the sphere 109b does not contact the inner surface of the relief hole 114r.

[0032] In an emebodiment, the right floor plate 114 further includes a right side docking detector 114d that is configured to differentiate the right floor plate 114 from the left floor plate 116. In an embodiment, right side docking detector 114d could be a sticker, coloured codes and so on. Fig. 2 depicts a right floor plate according to an embodiment disclosed herein.

[0033] The left floor plate 116 includes at least one locating hole 116l, at least one relief-hole 116r, at least one pattern for camera detection 116p. The locating hole 116l is provided corresponding to the sphere 109b that is configured to dock the medical device 200 to the left side of the CT scanner table. Further, the locating hole 116l is configured to receive the sphere 109b. In an embodiment, the sphere 109b is provided having a diameter slightly higher than the diameter of the locating hole 116l, such that the locating hole 116l could be configured to receive the sphere 109b up to a certain depth. In one embodiment, the sphere 109b includes a diameter of 16mm and the locating hole 116l includes a diameter of 12mm. The locating hole 116l further enables aligning the sphere 109b, such that the center of sphere 109b and the center of locating hole 116l lies along the

same axis. In an embodiment, the locating hole 116l is provided as a through hole. In another embodiment, the locating hole 116l is provided as a semi through or non through hole without otherwise deterring intended function of the docking mechanism as could be deduced from this description.

[0034] The relief hole 116r is provided corresponding to the sphere 109a that is configured to dock the medical device 200 to the right side of the CT scanner table. The relief hole 116r is configured to allow the sphere 109a to pass through it, such that the outer surface of the sphere 109a does not contact the inner surface of the relief hole 116r. In an embodiment, the relief hole 116r is provided having a diameter considerably higher than the diameter of sphere 109a, such that the outer surface of the sphere 109a does not contact the inner surface of the relief hole 116r. In an embodiment, the sphere 109a includes a diameter of 16mm and the relief hole 116r includes a diameter of 18mm. In an embodiment, the relief hole 116r is provided as a through hole. In another embodiment, the relief hole 116r is provided as a semi through or non through hole such that the outer surface of the sphere 109a does not contact the inner surface of the relief hole 116r.

[0035] In an embodiment, the left floor plate 116 further includes a left side docking detector 116d that is configured to differentiate the left floor plate 116 from the right floor plate 114. In an embodiment, left side docking detector 116d could be a sticker, coloured codes and so on. In an embodiment, the right floor plate 114 and the left floor plate 116 is made of stainless plate having thickness of 2.5mm. However, it is also within the scope of invention, that the right floor plate 114 and the left floor plate 116 could be made of any other material having any other thickness without otherwise deterring intended function of the docking mechanism 100 as can be deduced from this description. Fig. 3 depicts a left floor plate according to an embodiment disclosed herein.

[0036] For docking the medical device to at least one of right side of the CT scanner table or left side of the CT scanner table, the corresponding second part 104 (right floor plate 114 or left floor plate 116) is fixed on to the floor. In an embodiment, at least one of the right floor plate 114 or the left floor plate 116 is fixed on to respective sides of the CT scanner table using a removable securing mechanism such as double sided adhesive tape. However, it is also within the scope of inveniton, that the right floor plate 114 or the left floor plate 116 could be fixed on to respective sides of the CT scanner table using any other type of securing mechanism without otherwise deterring the intended function of the docking mechnaism 100 as can be deduced from this description. In another embodiment, the right floor plate 114 or the left floor plate 116 could be

fixed on to respective sides of the CT scanner table using a fixing jig and secured using a removable securing mechanism.

[0037] The medical device 200 includes a retractable wheels 202 and a foot plate 204. The retractable wheels 202 is configured such that the medical device could be rested on the wheels 202 or on a foot plate 204. In an embodiment, the first part 102 is fixed on to the foot plate 204. However, it is also within the scope of invention, that the first part 102 could be fixed on to any other elements of the medical device 200 with simple or no modification or with inclusion of certain elements to the medical device 200 or removing certain elements to the medical device 200 without otherwise deterring intended function of the docking mechanism as can be deduced from this description.

[0038] In an embodiment, the foot plate 204 is square shaped, such that one plate from the plurality of plates 106 is conencted to each side of the foot plate 204. Further each of the plate 106 includes two ball housings 108a having the sphere 109a and 108b having the sphere 109b. Further, if the user requires to dock the medical device 200 to the right side of the CT scanner table, the user can lower the medical device 200 such that the locating holes 114l in the right foot plate 114 receives the sphere 109a. The sphere 109a is provided having a diameter slightly higher than the diameter of the locating hole 114l, such that the locating hole 114l could be configured to receive the sphere 109a up to a certain depth and then docks. The locating hole 114l further enables aligning the sphere 109a, such that the center of sphere 109a and the center of locating hole 114l lies along the same axis. Further, the relief hole 114r is configured to allow the sphere 109b to pass through it, such that the outer surface of the sphere 109b does not contact the inner surface of the relief hole 114r. In an embodiment, the relief hole 114r is provided having a diameter considerably higher than the diameter of sphere 109b, such that the outer surface of the sphere 109b does not contact the inner surface of the relief hole 114r. Further, the leveling bolt 110 is configured to adjust the inclination of device 200 to correspond to the orientation of CT scanner table (not shown). In another embodiment, the leveling bolt 110 is provided with a nut 112 to permanently lock the inclination of the device 200 in the final calibrated position. . In an embodiment, the leveling bolt 110 is a jack bolt. Fig. 4 depicts a medical device that is docked using a docking mechanism according to an embodiment of the present invention.

[0039] In an embodiment, the docking mechanism 100 further includes at least one camera (not shown) fixed on to the right floor plate 114 and the left floor plate 116. In one embodiment, the camera is mounted on to the bottom section of the foot plate 204 such that it is not in physical

contact with the right floor plate 114 and the left floor plate 116 respectively. The camera is configured to read the pattern for camera detection 114p provided on each of the right floor plate 114 and the left floor plate 116 and captures the images of the pattern. In an embodiment, the camera is configured to captures the images of the pattern for camera detection 114p provided on each of the right floor plate 114 and the left floor plate 116 and store the data with respect to the pattern as a reference image when the medical device 200 is first docked and calibrated. Further, when the medical device 200 is re-docked, the camera is configured to capture the new position of the pattern 114p and compare the new position of the pattern 114p with the reference image/pattern. The camera is configured to operate at a pixel level, thereby enabling detection of minute deviations. In another embodiment, the docking mechanism 100 further includes a controller (not shown). The controller regulates the functioning of the camera, such that if the deviation in the orientation of the medical device detected by the camera is within a desired number of pixels, the controller alerts the user regarding complete docking. Further, if the deviation in the orientation of the medical device exceeds desired number of pixels, the controller alerts the user regarding incomplete docking. In an embodiment, the alerting could be performed by a display device, an audio device and so on. The controller includes a processor core that is configured to perform the comparison and to alert the user, a memory that is configured to store the reference pattern and programmable input/output peripherals that is configured to receive and send data to the camera or the display device. However, it is also within the scope of the invention that the instead of controller, the docking mechanism may include any other hardware device, combination of hardware devices, software devices or combination of hardware or software devices that could achieve one or more process discussed in the description.

[0040] In another embodiment, the first part 102 of the docking mechanism 100 include plurality of plunger switch; say a right plunger switch 118r and a left plunger switch 118l. Further, the right floor plate 114 and the left floor plate 116 include plunger receiving portion 120r and 120l respectively. The first part 102, the right floor plate 114 and the left floor plate 116 are configured such that the plunger switch touches the plunger receiving portion 120r and 120l provided in the right floor plate 114 and the left floor plate 116 respectively. In an embodiment, when the medical device 200 is docked to the right side of the CT scanner table, the medical device is lowered vertically such that the sphere 109a provided in the first part 102 is received by the locating hole 114l provided in the right floor plate 114 and the sphere 109b provided in the first part 102 is received by the relief hole 114r provided in the right floor plate 114. Further, the right plunger

switch 118r comes in contact with the plunger receiving portion 120r provided in the right floor plate 114. In an embodiment, the plunger switch 118r is provided with a repeatability of 10microns or lesser. The plunger switch 118r is configured to detect the orientation of medical device 200 with respect to CT scanner table during repeatable docking to an accuracy of 10 microns or lesser. Further, the plunger switch 118r is provided in communication with a display device that is configured to alert the user if the deviation in orientation is more than 10 microns.

[0041] In one embodiment, when the medical device 200 is docked to the left side of the CT scanner table, the medical device is lowered vertically such that the sphere 109b provided in the first part 102 is received by the locating hole 116l provided in the left floor plate 116 and the sphere 109a provided in the first part 102 is received by the relief hole 116r provided in the left floor plate 116. Further, the left plunger switch 118l comes in contact with the plunger receiving portion 120l provided in the left floor plate 116. In an embodiment, the plunger switch 118l is provided with a repeatability of 10microns or lesser. The plunger switch 118l is configured to detect the orientation of medical device 200 with respect to CT scanner table during repeatable docking to an accuracy of 10 microns or lesser. Further, the plunger switch 118r is provided in communication with a display device that is configured to alert the user if the deviation in orientation is more than 10 microns. Fig. 6 and Fig. 7 depict a docked position and undocked position respectively of the docking mechanism with plunger switch according to another embodiment of the present invention.

[0042] In yet another embodiment, the right floor plate 114 includes an extended (raised) portion 114e around the right locating hole 114l such that when the the medical device is lowered vertically, the sphere 109a is received by the right locating hole 114l and align against the extruding portion 114e. In an embodiment, the extended (raised) portion 114e around the right locating hole 114l eliminates the need for providing a relief hole 114r, as the extruding portion 114e results in providing the sphere 109b in the free space between the top of the extruding portion 114e and the top of the right floor plate 114 when the medical device is lowered. Similarly, the left floor plate 116 includes an extended (raised) portion 116e around the right locating hole 116l such that when the the medical device is lowered vertically, the sphere 109b is received by the left locating hole 116l and align against the extruding portion 116e. In an embodiment, the extended (raised) portion 116e around the left locating hole 116l eliminates the need for providing a relief hole 116r, as the extruding portion 116e results in providing the sphere 109a in the free space between the top of the extruding portion 116e and the top of the left floor plate 116 when the medical device is lowered.

Fig. 8a and 8b depict a right floor plate and a left floor plate respectively according to another embodiment of the present invention.

[0043] It should be noted that the aforementioned configuration of docking mechanism 100 is provided for the ease of understanding of the embodiments of the invention. However, certain embodiments may have a different configuration of the components of the docking mechanism 100 and certain other embodiments may exclude certain components of the docking mechanism 100. For example, instead of four plates 106 provided in the first part 102, the docking mechanism could include any number of plates based on the surface to which the first part 102 is attached and based on the user requirement. Further, the docking mechanism 100 could include any number of locating holes and any number of spheres depending upon the design of the device that has to be docked and based on user requirements. Therefore, such embodiments and any modification by addition or exclusion of certain components of the docking mechanism 100 without otherwise deterring the intended function of the docking mechanism 100 as is apparent from this description and drawings are also within the scope of this invention.

[0044] The method for docking a medical device 200 such as a robotic device corresponding to the CT scanner table is explained herein below. FIG. 9 is a flow chart depicting the method for docking a medical device 200 such as a robotic device corresponding to the CT scanner table according to an embodiment disclosed herein. The method includes securing the floor plate to the floor (step 302). At least one of right floor plate 114 and left floor plate 114l is fixed to the right side and left side of the CT scanner table respectively. In an embodiment, each of the right floor plate 114 and left floor plate 116 includes plurality of locating holes and relief holes. The first part 102 is attached to the foot plate 204 of the medical device 200 (step 304). The first part 102 includes plurality of plates 106 such that each side of the foot plate 204 includes at least one plate 106. Each of the plate 106 includes two ball housing 108a and 108b having the sphere 109a and 109b. Further, if the medical device 200 is docked to the right side of the CT scanner table, the medical device is lowered (step 306), such that the sphere 109a is received inside the locating hole 114l and the sphere 109b is received inside the relief hole 114r. Further, if the medical device 200 is docked to the left side of the CT scanner table, the medical device is lowered, such that the sphere 109b is received on to the locating hole 116l and the sphere 109a is received inside the relief hole 116r. After docking, the medical device 200 is leveled with respect to the CT scanner table (step 308). In an embodiment, four leveling bolts 110 are provided on top of the ball housing 108 in order to level the medical device 200. Once leveled, the bolts 110 are locked permanently to preserve the

calibration (step 310). The camera is configured to read the pattern for camera detection 114p provided on each of the right floor plate 114 and the left floor plate 116 and captures the images of the pattern. In an embodiment, the camera is configured to captures the images of the pattern for camera detection 114p provided on each of the right floor plate 114 and the left floor plate 116 and store the data with respect to the pattern as a reference image when the medical device 200 is first docked and calibrated. Further, when the medical device 200 is re-docked, the camera is configured to capture the new position of the pattern 114p and compare the new position of the pattern 114p with the reference image/pattern. The camera is configured to operate at a pixel level, thereby enabling detection of minute deviations (step 312). In another embodiment, the docking mechanism 100 further includes a controller (not shown). The controller regulates the functioning of the camera, such that if the deviation in the orientation of the medical device detected by the camera is within a desired number of pixels, the controller alerts the user regarding complete docking (step 314). Further, if the deviation in the orientation of the medical device exceeds desired number of pixels, the controller alerts the user regarding incomplete docking (step 316). In an embodiment, the alerting could be performed by a display device, an audio device and so on. The controller includes a processor core that is configured to perform the comparison and to alert the user, a memory that is configured to store the reference pattern and programmable input/output peripherals that is configured to receive and send data to the camera or the display device. However, it is also within the scope of the invention that the instead of controller, the docking mechanism may include any other hardware device, combination of hardware devices, software devices or combination of hardware or software devices that could achieve one or more process discussed below

[0045] It should be noted that the aforementioned steps for performing the method for docking a medical device corresponding to the CT scanner table are provided for the ease of understanding of the embodiments of the invention. However, various steps provided in the above method may be performed in the order presented, in a different order, or simultaneously. Further, in some embodiments, one or more steps listed in the above method may be omitted. Therefore, such embodiments and any modification that is apparent from this description and drawings are also within the scope of this invention.

[0046] The foregoing description of the specific embodiments will so fully reveal the general nature of the embodiments herein that others can, by applying current knowledge, readily modify and/or adapt for various applications such specific embodiments without departing from the generic concept, and, therefore, such adaptations and modifications should and are intended to be

comprehended within the meaning and range of equivalents of the disclosed embodiments. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation. Therefore, while the embodiments herein have been described in terms of preferred embodiments, those skilled in the art will recognize that the embodiments herein can be practiced with modification within the spirit and scope of the embodiments as described herein.

CLAIMS

We Claim,

1. A system for docking a device, said system comprising:

   a first part attached to said device; and

   a second part attached to a target surface, wherein

   said first part includes plurality of spheres, each having a first diameter;

   said second part includes plurality of holes, each having a second diameter;

   said plurality of holes is configured to receive said plurality of spheres; and

   said second diameter is lesser than said first diameter.

2. The system as claimed in claim 1, wherein said plurality of sphere is made of solid material.

3. A system for docking a medical device with respect to at least one of a right side of a Computer Tomography scanner table and a left side of a Computer Tomography scanner table, said system comprising:

   a first part having a right side sphere and a left side sphere attached to said medical device; and

   a second part having at least one of right floor plate and left floor plate secured to floor in said at least one of right side of the Computer Tomography scanner table and the left side of the Computer Tomography scanner table respectively, wherein

   said right side sphere and said left side sphere includes a first diameter;

   said right floor plate includes plurality of locating hole having a second diameter configured to receive said right side sphere and plurality of relief hole having a third diameter configured to receive said left side sphere;

   said left floor plate includes plurality of locating hole having a second diameter configured to receive said left side sphere and plurality of relief hole having a third diameter configured to receive said right side sphere;

   said first diameter is more than said second diameter; and

   said third diameter is more than said first diameter.

4. The system as claimed in claim 3, wherein at least one of said right floor plate and said left floor plate includes a plunger switch that is configured to detect the orientation of said medical device with respect to said Computer Tomography scanner table during repeatable docking to an accuracy of 10 microns.

5. The system as claimed in claim 3, wherein said right side sphere and said left side sphere is made of solid material.
6. The system as claimed in claim 3 further includes a camera, a pattern for camera detection and a controller, wherein

   said camera is configured to obtain image of said pattern for camera detection; and

   said controller is configured to determine orientation of said device based on said image of said pattern for camera detection.
7. The system as claimed in claim 3, wherein said right floor plate and said left floor plate is secured to the floor by a double sided adhesive tape.
8. The system as claimed in claim 3 further includes a leveling bolt and a nut provided in said first part, wherein

   said leveling bolt is configured to adjust orientation of said medical device; and

   said nut is configured to lock the medical device in a desired orientation.
9. A method for docking a medical device with respect to at least one of a right side of a Computer Tomography scanner table and a left side of a Computer Tomography scanner table, said method comprising
   a. attaching at least one of right floor plate and left floor plate to a floor in said at least one of right side of the Computer Tomography scanner table and the left side of the Computer Tomography scanner table respectively;
   b. attaching a first part having a right side sphere and a left side sphere to said medical device; and
   c. docking said medical device to said floor by allowing said right floor plate and said left floor plate to receive said right side sphere and said left side sphere respectively.
10. The method as claimed in claim 9, further includes adjusting the orientation of the medical device corresponding to the CT scanner table.

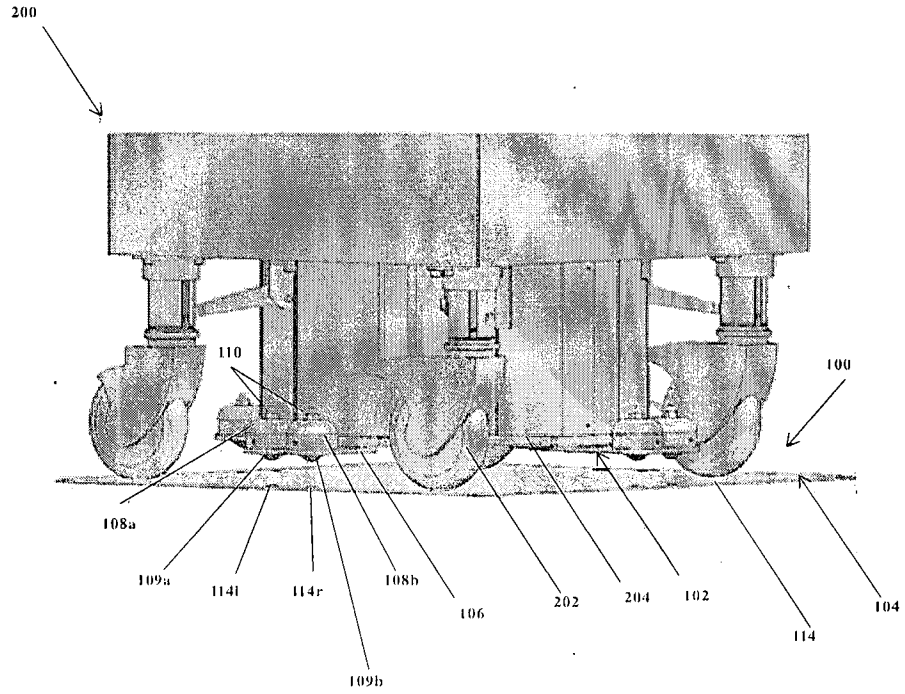
200
110
100
108a
109a
114l
114r
108b
106
202
204
102
104
114
109b

Fig. 1

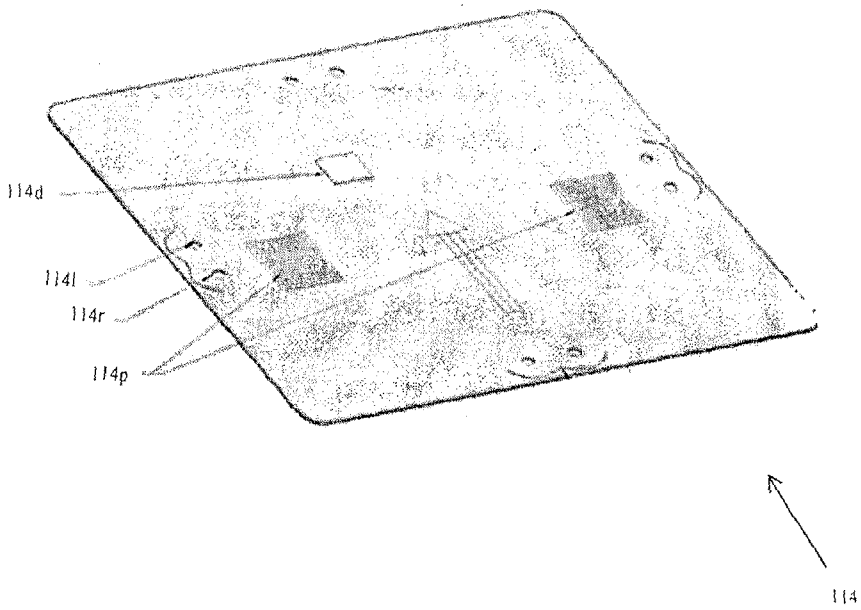

Fig. 2

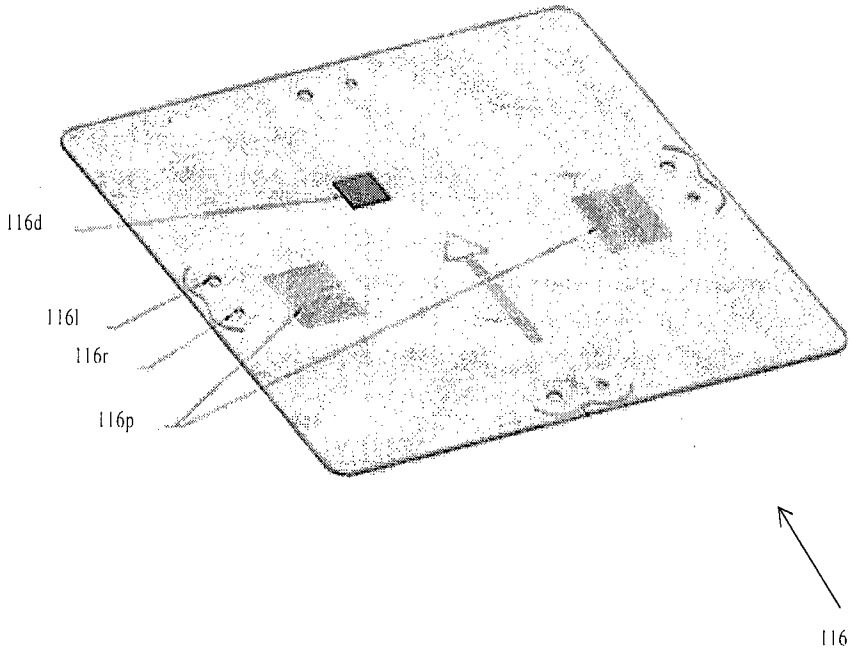

Fig. 3

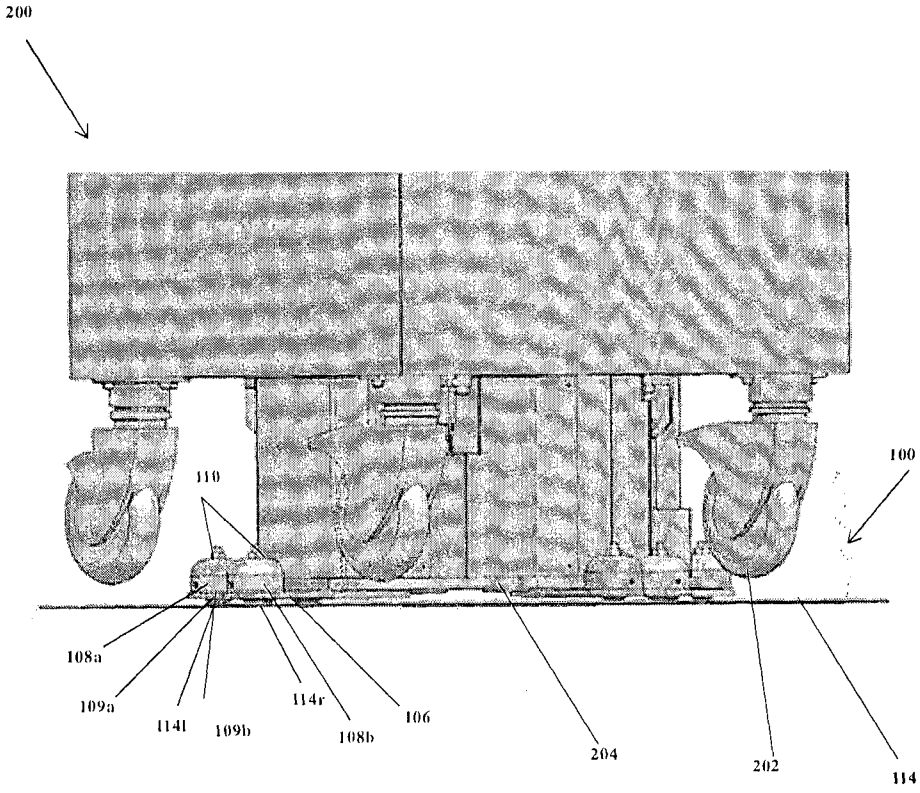

Fig. 4

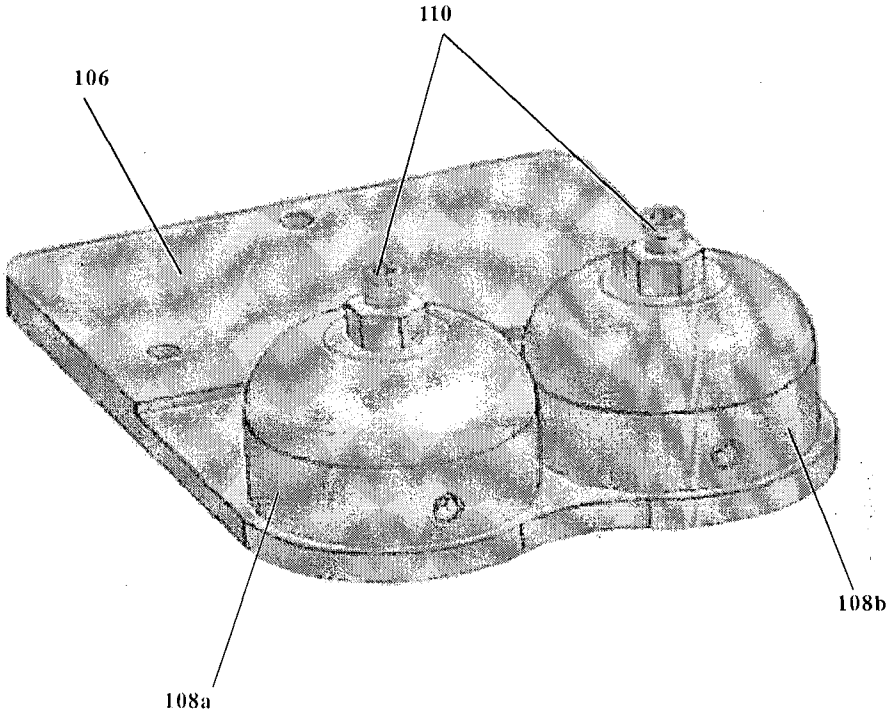

Fig. 5

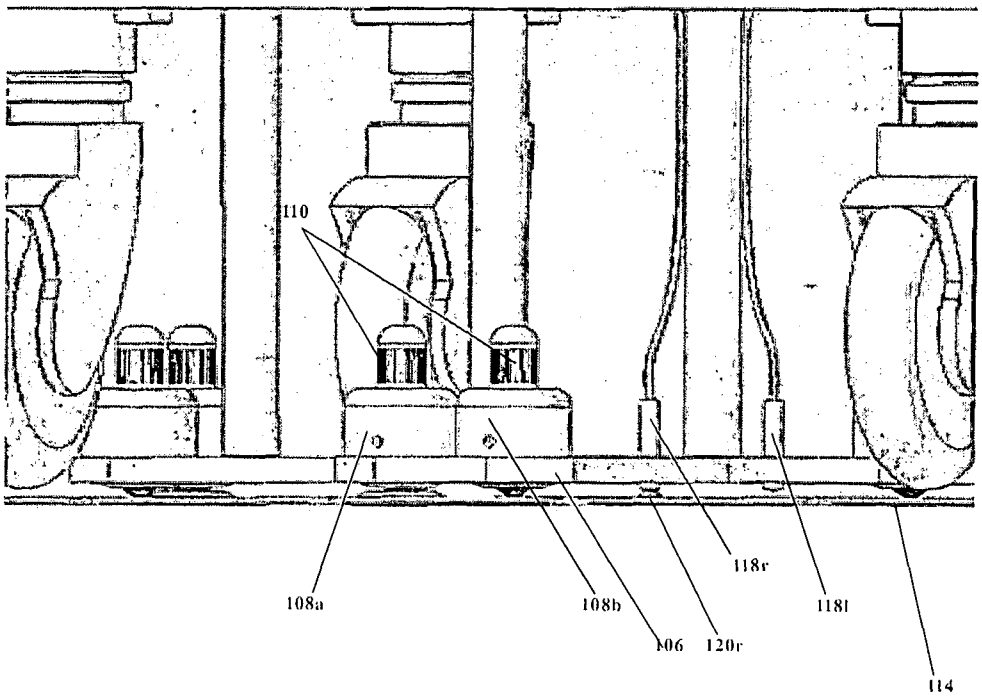

Fig. 6

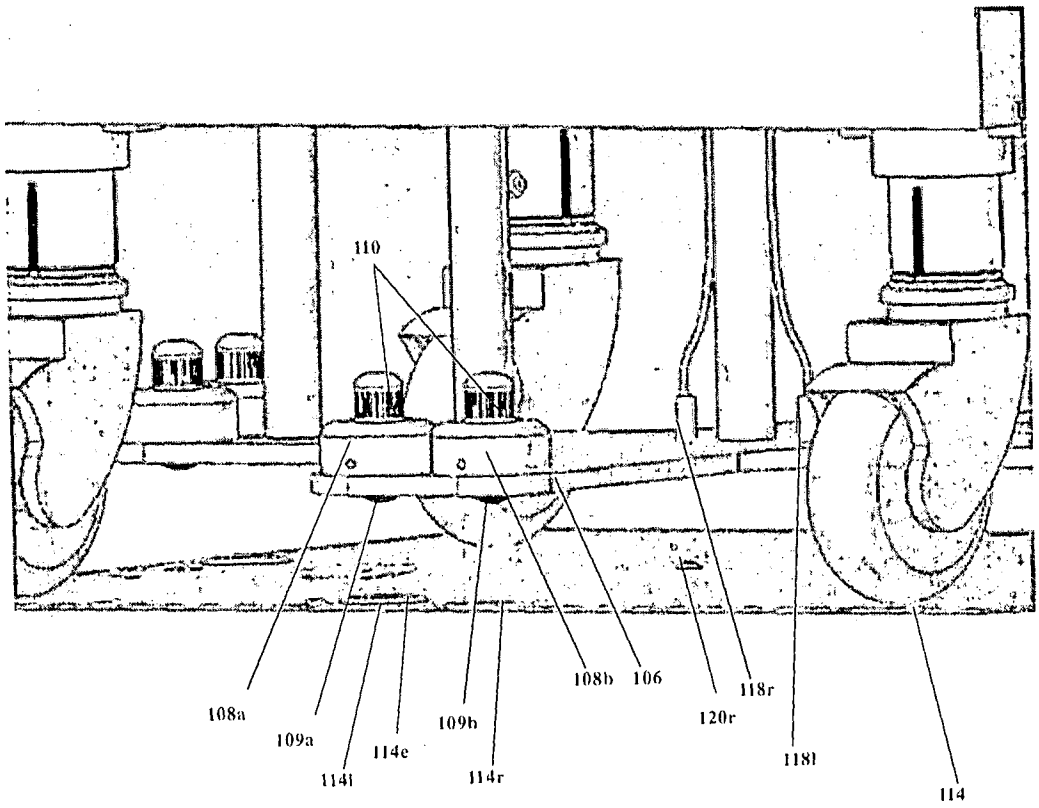

Fig. 7

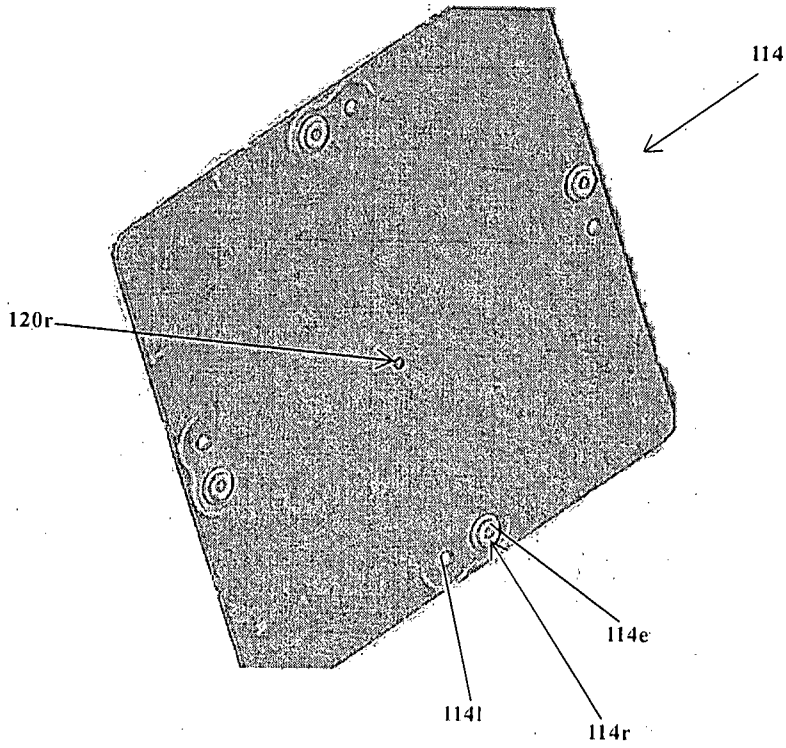

Fig. 8a

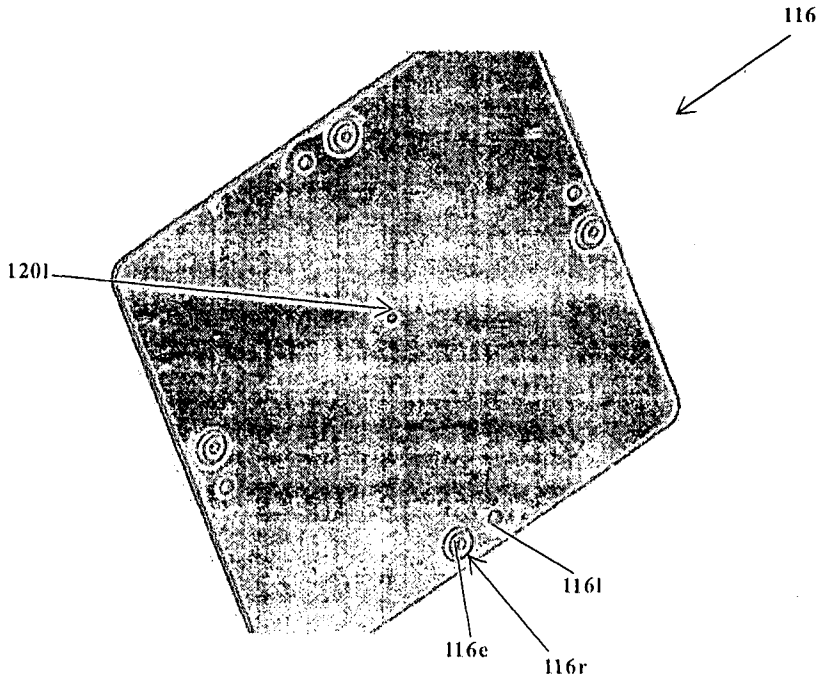

Fig. 8b

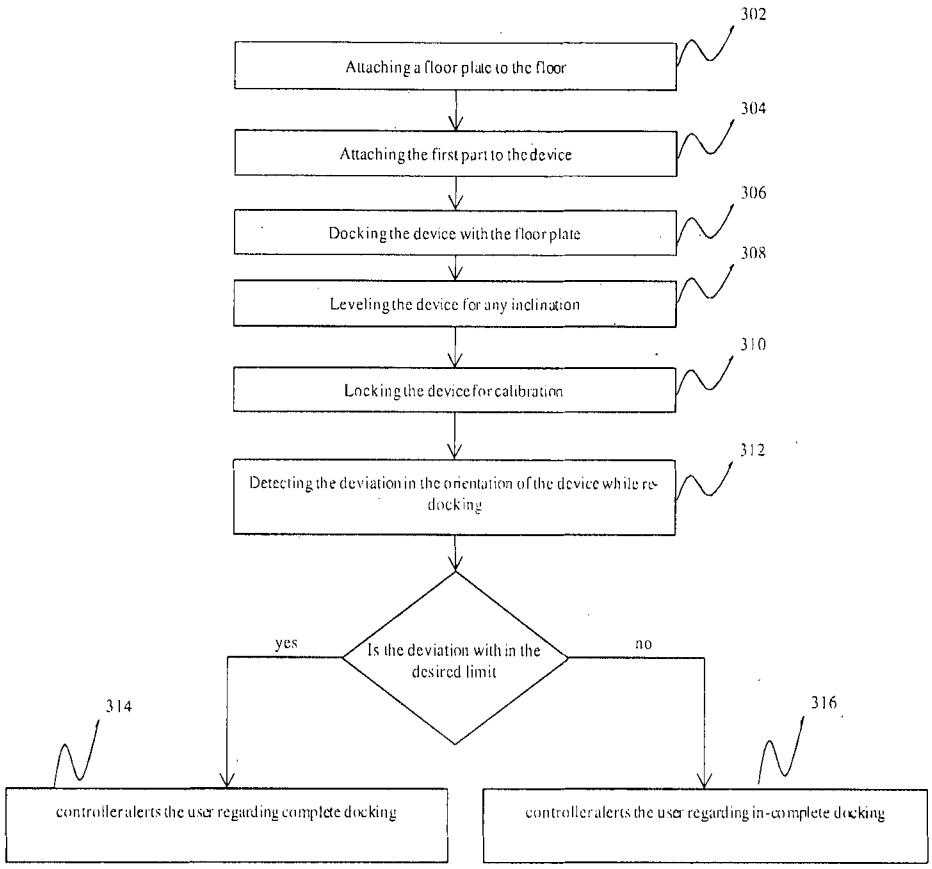
302
Attaching a floor plate to the floor
304
Attaching the first part to the device
306
Docking the device with the floor plate
308
Leveling the device for any inclination
310
Locking the device for calibration
312
Detecting the deviation in the orientation of the device while re-docking
Is the deviation with in the desired limit
yes
no
314
316
controller alerts the user regarding complete docking
controller alerts the user regarding in-complete docking

Fig. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2012/000656

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B6/04 A61G7/10 A61G13/10
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61B A61G A47C B60B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2004 017944 A (OKADA SEISAKUSHO KK) 22 January 2004 (2004-01-22) abstract figures 1,2,4-7,9	1,2
A	EP 1 985 237 A1 (BUCK ENGINEERING & CONSULTING [DE]) 29 October 2008 (2008-10-29) abstract paragraph [0023] - paragraph [0031] figures 1-3	1,3,9
A	GB 206 692 A (ALFRED HARRY HUDDART) 15 November 1923 (1923-11-15) the whole document	1,3,9

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 January 2013	05/02/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Artikis, T

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2012/000656

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 161 237 A (TANG WEN THYE [US] ET AL) 19 December 2000 (2000-12-19) abstract column 2, line 28 - column 3, line 2 figure 1 -----	1,3,9

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IN2012/000656

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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EP 1985237 A1	29-10-2008	NONE	
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US 6161237 A	19-12-2000	NONE	