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(54) **Title**: LEFT RADIAL ACCESS, RIGHT ROOM OPERATION, PERIPHERAL INTERVENTION SYSTEM

(57) **Abstract**: Systems and methods for left radial access, right room operation peripheral interventions are provided that include left radial bases to stabilize a left arm of a cardiac patient across a midsagittal plane, transradiant right radial bases to position a right arm of the patient, and radiodense radiation reduction barriers located between the patient and a doctor.

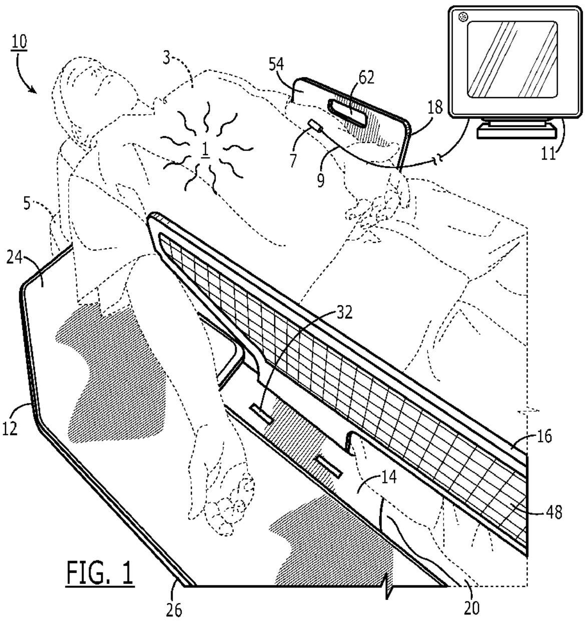

FIG. 1

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LEFT RADIAL ACCESS, RIGHT ROOM OPERATION, PERIPHERAL INTERVENTION SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims benefit of U.S. Provisional Patent Application Serial No. 61/856,754, filed in the U.S. Patent and Trademark Office on July 21, 2013, which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] Trans-radial access ("TRA") is an increasingly utilized procedure for peripheral interventions on catheter tables. Peripheral interventions via a patient's left wrist are advantageous from an anatomical standpoint. First, due to proximity and catheter support, sub-clavian, vertebral and certain carotid interventions are more easily performed via a patient's arm rather than the groin. Second, renal and mesenteric vessels have a superior oriented origin, and their access from the arm is easier and more natural. Third, lower extremity interventions, particularly iliac and proximal superficial femoral artery, are more accessible from the arm when there is contralateral disease, or if the iliac bifurcation is hostile.

[0003] For the treatment of iliac disease, there are specific potential advantages for a radial puncture compared with the more traditional femoral approach. Femoral access may be difficult when crossing an iliac lesion from the contralateral side. Moreover, precise stent placement may be problematic if contralateral iliac disease needs to be treated. In such cases, TRA may permit same-day discharge and prevent the need to access the contralateral groin and for crossover.

[0004] However, traditional TRA platforms do not permit both right and left radial access from either the left or right side of the table. Specifically, existing platforms do not permit left radial access and operation from the right side of the operating table. Additionally, existing arm boards that include radiolucent materials so as to not interfere with medical imaging provide little to no protection from ionizing radiation to, e.g., a doctor performing left radial access procedures from the right side of the catheter table.

[0005] What is needed in the field of trans-radial access is a left radial access, right room operation system that is also suitable for use during left radial lower extremity procedures. The system should also reduce or eliminate staff exposure to ionizing radiation during catheterization procedures without impairing the ability to obtain the necessary diagnostic medical images during the procedures. The system also should be economical to manufacture, and it should be simple, effective, and reliable to use and reuse.

BRIEF SUMMARY OF THE DISCLOSURE

[0006] The present disclosure is directed in general to left radial access, right room operation, lower extremity peripheral platforms for use in left radial peripheral interventions. More specifically, the trans-radial access platform provides radiation reduction and allows for left and right radial access, for different procedures, from lower extremity peripheral to pacemaker and cardiac interventions. As will be understood from the present disclosure and by its practice, the various embodiments described herein and their equivalents are simple to manufacture, install and use.

[0007] For example, in one embodiment according to the present disclosure, a system is provided for use in supporting a patient lying in supine position with left arm secured across the patient's midsagittal or median plane during a lower extremity peripheral procedure. The system may be a left radial access, right room operation, peripheral intervention system for use with an imaging system. The peripheral intervention system may have a left radial base that stabilizes a left arm of a patient across a midsagittal plane of the patient during a lower extremity peripheral intervention on a procedure table. A right radial base may be positioned substantially parallel to an operating surface of the procedure table, the right radial base being transradiant and configured to position a right arm of the patient in a direction away from the midsagittal plane during the lower extremity peripheral intervention. Also, a radiation reduction barrier may be placed apart from the left radial base and from the right radial base, the radiation reduction barrier having a radiodense material disposed between the patient and an attending staff member to reduce scatter radiation from the patient in a direction of the staff member during a procedure.

[0008] In another embodiment, a left radial access, right room operation peripheral intervention system for use with an imaging system may include a base board being configured for connection proximate a table having a left side and a right side corresponding to a left arm and a right arm of a patient; a left radial base attached to the base board and being configured to cushion and stabilize a left arm of a cardiac patient across a midsagittal plane of the patient during a lower extremity peripheral intervention on the table, wherein an attending cardiologist may perform the intervention from the right side of the table; and a radiation reduction barrier spaced apart from the left radial base, the radiation reduction barrier having a radiodense material disposed between the patient and an attending staff member to reduce radiation scattering from the patient in a direction of the staff member.

[0009] In yet another embodiment, a left radial access, right room operation peripheral intervention system for use with an imaging system may have a base board being configured for attachment proximate a procedure table; a left radial base attachable to the base board and being configured to stabilize a left arm of a patient across a midsagittal plane of the patient during a lower extremity peripheral intervention on the procedure table; a right radial base attachable to the base board and disposed substantially parallel to an operating surface of the procedure table, the right radial base being transradiant and configured to position a right arm of the patient in a direction away from the midsagittal plane during the lower extremity peripheral intervention; a radiation reduction barrier attachable to the base board and spaced apart from the left radial base and from the right radial base, the radiation reduction barrier having a radiodense material disposed between the patient and an attending staff member to reduce radiation scattering from the patient in a direction of the staff member during an imaging procedure; and a radiodense apron releasably connected to the base board.

[00010] In a further embodiment, a left radial access, right room operation peripheral intervention system for use with an imaging system may include a right radial base having a base board attachable to a procedure table with a right side and a left side corresponding to a right arm and a left arm of a patient, the right radial base being disposed substantially parallel to an operating surface of the operating table, the right radial base board being disposed under the operating surface, the right radial base being transradiant and configured to position the right arm of the patient in a direction away from the midsagittal plane during the lower extremity peripheral intervention; a left radial base in connection with the right radial base board and being configured to stabilize a left arm of a patient across a midsagittal plane of the patient during a lower extremity peripheral intervention on the procedure table; a radiation reduction barrier attachable to a right radial base board under the table surface, the radiation reduction barrier spaced apart from the left radial base and from the right radial base, the radiation reduction barrier having a radiodense material disposed between the patient and an attending staff member to reduce radiation scattering from the patient in a direction of the staff member during an imaging procedure; and a radiodense apron releasably connected to the base board.

[00011] An exemplary method for left radial access and right room operation peripheral intervention system may include joining a left radial base proximate a procedure table having a left side corresponding to a left arm of a patient and a right side corresponding to right arm of a patient; stabilizing the left arm of a patient across a midsagittal plane of the patient with the left radial base; joining a radiation reduction barrier proximate the right side of the procedure table spaced apart from the left radial base, the radiation reduction barrier having a radiodense material disposed between the patient and an attending staff member; and performing a lower extremity peripheral intervention on the procedure table through the left arm of the patient from the right side of the operating table.

[00012] Additional aspects of the present subject matter are set forth in, or will be apparent to, those of ordinary skill in the art from the detailed description herein. Also, it should be further appreciated that modifications and variations to the specifically illustrated, referred and discussed features and elements hereof may be practiced in various embodiments and uses of the disclosure without departing from the spirit and scope of the subject matter. Variations may include, but are not limited to, substitution of equivalent means, features, or steps for those illustrated, referenced, or discussed, and the functional, operational, or positional reversal of various parts, features, steps, or the like. Those of ordinary skill in the art will better appreciate the features and aspects of such variations upon review of the remainder of the specification.

BRIEF DESCRIPTION OF THE DRAWINGS

[00013] A full and enabling disclosure of the present subject matter, including the best mode thereof, directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended figures, in which:

[00014] **FIGURE 1** is a partial perspective view of an operating system according to an aspect of the disclosure;

[00015] **FIGURE 2** is a perspective view of the system as in **FIGURE 1**, particularly showing an exemplary feature according to an aspect of the disclosure;

[00016] **FIGURE 3** is another perspective view of the system as in **FIGURE 1**, particularly showing another exemplary feature according to an aspect of the disclosure;

[00017] **FIGURE 4** is an elevational view of an aspect of the system as in **FIGURE 1**;

[00018] **FIGURE 5** is a plan view of another feature of the system as in **FIGURE 1**, and **FIGURES 5A-5C** are respective end and side views of this aspect;

[00019] **FIGURE 6** is an elevational view of another aspect of the system as in **FIGURE 1**;

[00020] **FIGURE 7A** is an elevational view of a further feature of the system as in **FIGURE 1** and **FIGURE 7B** is an end view of the feature as in **FIGURE 7A**;

[00021] **FIGURE 8** is an elevational end view of an operating system according to another aspect of the disclosure;

[00022] **FIGURE 9** is an elevational view of a portion of a system according to an aspect of the disclosure;

[00023] **FIGURE 10** is a plan view of the system as in **FIGURE 9**; and

[00024] **FIGURE 11** shows in parts 11A and 11B results of a radiation scatter survey of an embodiment according to the disclosure.

DETAILED DESCRIPTION OF THE DISCLOSURE

[00025] Detailed reference will now be made to the drawings in which examples embodying the present subject matter are shown. The detailed description uses numerical and letter designations to refer to features of the drawings.

[00026] The drawings and detailed description provide a full and written description of the present subject matter, and of the manner and process of making and using various exemplary embodiments, so as to enable one skilled in the pertinent art to make and use them, as well as the best mode of carrying out the exemplary embodiments. However, the examples set forth in the drawings and in the detailed description are provided by way of explanation only and are not meant as limitations of the disclosure. The present subject matter thus includes any modifications and variations of the following examples as come within the scope of the appended claims and their equivalents.

[00027] Turning now to **FIGURE 1**, a trans-radial access catheter operating system is designated in general by the number **10**. The system **10** is structured in general for left radial access, right room operation by permitting a doctor to remain on a right side of an operating table while simultaneously reducing radiation in inferior and superior regions relative to the operating table. The system **10** broadly includes a right radial base or deck **12**, a base board, main base or platform **14**, a superior radiation shield or barrier **16**, which may include a unitary or insertable radiation reducing material **48**, a left radial base, wall or fence **18**, an inferior right radiation apron or curtain **20**, and an inferior left radiation apron or curtain **22** (see **FIGURE 2**). The exemplary components of the trans-radial access catheter operating system **10** may be made from durable, water-resistant, reusable materials that are susceptible to high pressure and/or heated sterilization and may also be constructed to block or permit passage of radiation.

[00028] In the example of **FIGURE 1**, a cardiac or lower peripheral patient **3** is placed on a procedure or operating table **5** that hosts the main platform **14**. The deck **12**, the radiation shield **16**, and the left radial base **18** may be in connection with the platform **14** or attached to the platform **14** via mechanical connections that may include slots or holes **36** formed in a first or top side **32** of the platform **14**. As shown, a right arm of the cardiac patient **3** may be laid along a first surface or first arm side **24** opposite a second surface or connection or bottom side **26** of the right radial base **12**. Also shown, a first or interior face or side **54** of the fence **18** positions a left arm of the patient **3** across a midsagittal plane or center line **70** of the patient **3** (see **FIGURE 2**). A board or brace (not shown) may be provided to stabilize and immobilize the arm for preliminary access procedures and until the fence **18** is positioned. As will be explained in greater detail below, the fence **18** may be adjusted relative to the platform **14** and to accommodate the patient **3**. A handle **62** may be provided to carry and position the left radial base **18**.

[00029] As further shown in **FIGURE 1**, one or more medical instruments **7** (shown schematically) are introduced through a sheath **9** in the stabilized left arm. X-ray or fluoroscopic imaging systems or other types of medical imaging systems are used by a doctor or staff on the right side of the table **5**, also referred to as the staff side or patient right arm side, to visualize on appropriate equipment or monitor **11** the positioning of the medical instruments **7** in the patient **3**.

[00030] The exemplary deck **12** in **FIGURE 1** is made of transradiant or radiotransparent material such as high density polyethylene (HDPE). Thus, the deck **12** is constructed to permit passage of X-ray photons **1** during imaging of a patient, for example, to assess blockages in the patient during a procedure. As shown, the first surface **24** of the deck **12** is sufficiently large, as preferred by most doctors and staff, to accommodate surgical instruments including wires, guides, balloons and stents **7**, many of which may exceed 360 centimeters (cm) in length and require the space provided by the surface **24** in order to more easily access and manipulate these instruments. Also, the X-ray or ionizing radiation **1** (shown schematically in **FIGURE 1**) passes through the patient **3**, but the ionizing radiation material **48** of the radiation shield **16** blocks or attenuates any rays **1** that are scattered by the patient's body toward staff working with the instruments **7** on the right arm side of the table **5**.

[00031] **FIGURE 2** most clearly shows the left radial base or fence **18** located opposite the vertically disposed radiation barrier **16**. As shown, the fence **18** may be releasably attached to the base board **14** via the apertures **36**, which are located in this example above a portion of the radiation curtain **22** with the operating table **5** located between the body **14** and the curtain **22**. As a 4-way arrow **72** indicates, the fence **18**, like the radiation barrier **16**, may be adjusted toward or away from the patient **3** to account for a smaller or larger patient **3** such that the left arm remains in position across the midsagittal plane **70**.

[00032] **FIGURE 3** particularly shows a portion of the trans-radial access operating system **10** from the right side of the procedure room. As introduced, the system **10** may include the right radial base **12**, the main platform **14**, the radiation barrier **16**, the left radial base **18**, and the right radiation apron **20**. Here, the radiation barrier **16** may be hollow to allow for insertion of the radiation attenuating material **48**. The material **48** may be lead, antimony, tin, barium, bismuth, cesium, tungsten, or any suitable material to reduce scatter radiation. The exemplary lead **48** may be about 1/16 of an inch or about 1.58 mm in thickness and sufficiently radiodense to absorb, inhibit, attenuate, or block ionizing radiation emanating from a patient being x-rayed, i.e., scatter radiation.

[00033] **FIGURE 3** further shows that the right radial base **12** and the curtain **20** may be mated with the main platform **14**. Alternatively, the right radial base **12** may be unitarily formed with the main platform **14**. Moreover, the radiation barrier **16** may include latches, hinges, spring elements or the like **74** that permit folding of the barrier **16** down and over either the right radial base **12** or the platform **14** for patient positioning or for set-up and storage. Here, the barrier **16** may also include an angled area or cut-out **76** to permit passage of a patient's arm to the base **12** (compare, e.g., **FIGURE 1**). An area **80** is established between the angle **76** and the base **12** that is sufficiently large for the patient's arm but not so considerable as to reduce the effective radiation reduction area of the barrier **16**. The surface area **80** also provides the physician with a large, stable work surface. Also shown in this example, the base **12** is angled or has an angled area **78** to allow for a C-Arm of x-ray equipment for proper angulation. However, the deck **12** is not limited to the exemplary embodiment in **FIGURE 3** and may be constructed with a different surface area or geometries, including a lip at area **78** to secure surgical instruments on the deck **12**.

[00034] With continued reference to **FIGURE 3** as well as **FIGURE 4**, the right radiation apron **20** may be attachable to the platform **14** via brackets or connection devices **40**. The curtain **20**, similar to the radiation barrier **16**, may be made of radiation absorbing or reducing material **68** such as lead, antimony, tin, barium, bismuth, cesium, tungsten, and the like. In this example, the curtain **20** includes a series of pockets or sleeves **66** into which respective material slabs or inserts **68** are placed. This arrangement may be preferred to a solitary lead (Pb) apron, for instance, in order to reduce the weight of the curtain **20** when it is being attached to the deck **12** or the platform **14**; to wash the curtain **20** more easily; and/or to replace the inserts **68** with different or thicker radiodense materials as needed.

[00035] Turning now to **FIGURE 5** and its side and end views in **FIGURES 5A-5D**, the base board **14** as briefly introduced is most clearly shown. As noted, the board **14** may be unitarily constructed with the right radial base **12** but in this example, a series of slots or holes **36** in the first or top side **32** extend through the second or bottom side **34** to permit component placements tailored to accommodate different sized patients. As shown, the board **14** may include a radiation reducing layer or insert **38** on or within the board **14** that sits under the operating table (not shown) but does not interfere with patient imaging. This insert **38** may be positioned within and between radiation curtains (see, e.g., **120**, **122** in **FIGURE 8**). In one aspect, the insert **38** may be layered into the base board **14**. Also shown in **FIGURE 5**, the board **14** may include curtain or apron brackets or holders **44** that may have horizontally oriented apertures **44** or vertically oriented apertures **46** for attaching the curtains **20, 22** (see, e.g., **FIGURES 1** and **2**).

[00036] **FIGURE 6** most clearly shows the radiation barrier **16** as in **FIGURE 3**. As noted above, the barrier **16** may be constructed entirely from radiation attenuating material **48**, or the barrier **16** may be hollow for insertion of the material **48**. A handle **52** may be provided for carrying the barrier **16** and for manipulating its installation and removal from the base board **14** or procedure table **5** as previously introduced. In this example, the radiation barrier **16** may include one or more connectors such as L-shaped tabs **58**. These connectors **58** are inserted at an angle into the slots **36** as shown in **FIGURE 1** and the barrier **16** is then pressed or snapped into place substantially perpendicular to the operating table **5**. The handle **52** may be used to quickly pull the barrier **16** up and out of the slots **36** to adjust the barrier **16** or for cleaning and storage.

[00037] With reference to **FIGURES 7A** and **7B**, the left radial base **18** of the system **10** is shown most clearly. Here, the base **18** includes a first, staff, or patient side **54** and a second or outer side **56**. The handle **62**, briefly introduced above, is for transporting and positioning the base **18**. As shown, the left radial base **18** may include one or more tabs or inserts **58** for insertion through the holes **36** of the board **14** (see, e.g., **FIGURE 5**). In this example, the inserts **58** are L-shaped with a lower portion having a rectangular shaped extension. This construction permits insertion into the holes **36** at an angle and once in place, the base **18** is pushed down and in contact with the board **14** to lock the base **18** in place. Due to the pressure to be exerted by a patient's left arm against the base **18**, a brace, block or step **64** may be included on either or both sides **54**, **56** to assist with stability. Also on the patient side **54**, an arm rest, cushion, pad or padded projection **60** is provided which faces in a direction of the patient. The arm rest **60** ensures that the left arm, particularly the left wrist, crosses the midsagittal plane **70** (see, e.g., patient **3** in **FIGURE 2**) and can also provide padding for the comfort and protection of the arm of the patient in a manner that promotes proper wrist supination to allow for safe and efficient access to the patient's right artery.

[00038] In the embodiment shown in **FIGURE 8**, a trans-radial access system is designated in general by the number **110**. The system **110** is designed for left radial access, right room operation as it permits a doctor to remain on a right side of a procedure table while simultaneously reducing scatter radiation to the doctor emanating from inferior and superior regions relative to the table, i.e., areas respectively above and below the table **5**. The system **110** generally includes a right radial base or platform **112** having an arm surface **124**, a radiation shield or barrier **116**, which may include a unitary or insertable radiation reducing material **148**, a left radial base, wall or fence **118** with an arm cushion **160** and a stand **164**, a right radiation apron or curtain **120**, and a left radiation apron or curtain **122**. The exemplary components of the trans-radial access system **110** may be made from durable, reusable materials that are susceptible to high pressure and/or heated sterilization and may have radiation attenuation or blocking characteristics or alternatively, may permit passage of radiation.

[00039] As **FIGURE 8** shows, the radiation shield **116**, the left radial base **118**, and the radiation aprons **120**, **122** may be connected to the platform **112** via connecting devices or components **140**, although other attachment means may be used in the alternative or in addition to mechanisms **140**, such as snaps, snap-in ball joints, or the like. **FIGURE 8** also shows that the radiation shield **116** may substantially perpendicular to the platform **112** and may have a tunnel or interior compartment **170** in which a radiation insert **148** may be housed. The insert **148** may be extended away from the table **5** to increase the height or width of the insert **148** as needed, such as by telescoping or unfolding sections of the insert **148**. In this example, the insert **148** is a radiation absorbing material such as lead, cadmium, rhodium, or the like. In the case of an unusually large patient, a portion of the insert **148** may be extracted from the compartment **170** and pulled up and away from the table **5** to increase a height of the radiation shield **116** to protect a doctor or staff from radiation being scattered from a patient’s body during x-ray or other medical imaging.

[00040] Turning to **FIGURE 9**, an inferior radiation shield or drape is designated by the number **220**. The drape **220** may be attached to a base or main board **214** and may be divided into multiple sections such as sections **220A** and **220B**. Here, the two sections **220A**, **220B** overlap one another at area **272**. More particularly, the sections **220A**, **220B** each have loops or other connectors or attachments **274** that are in connection with bars, rods, or other connection devices **240A**, **240B**. The rod **240A** may be inserted or connected to a swivel assembly **276** that permits rotation of at least one of the sections **220A**, **220B** from about 0 to 45 degrees relative to the base board **214**. For instance, the assembly **276** may include an upper portion or section **276A** and a lower section **276B**. The rod **240A** may be inserted into the lower section **276B** while the other bar **240B** may be stationary or fixed and connected to upper portion **276A** and to another connection point or device **278**. Also shown, a drive handle **280** may be provided for a technologist to arrange the adjustable components of the system, such as by rotating section **276B** relative to section **276A** in order to move drape **220A**.

[00041] **FIGURE 9** further shows that the drape sections **220A**, **220B** may be constructed with sections, sleeves or pockets **266** to receive insertable lead (Pb) boards **268** (shown in phantom) or other radiation attenuating or blocking materials suitable to block radiation. More specifically, the insertable boards **268** may be radiodense, radiation absorbing or reducing material such as lead, antimony, tin, barium, bismuth, cesium, tungsten, and the like and may be from about 1/16 inch to about ¼ inch in thickness.

[00042] **FIGURE 10** most clearly shows the rod **240A** in connection with the swivel assembly **276** to permit rotation of the rod **240A** (and therefore curtain section **220A** shown in **FIGURE 9**). As shown, the rod **240A** may be adjusted, swiveled or rotated from about zero degrees to about 45 degrees as depicted by angle **282** relative to the base board **214**. Further shown, the bar **240B** may be attached to or inserted into the assembly **276** as well as the device **278**. This adjustable arrangement may provide further scatter radiation protection to staff standing in a direction nearer the device **278.** The overlap provided at area **272** (see **FIGURE 9**) will block scatter radiation with the rod **240A** swiveled outward.

[00043] **EXPERIMENTAL RESULTS**

[00044] <u>Introduction</u>. On June 22, 2013, a testing service conducted a radiation scatter survey in a heart catheterization room on a prototype based on the embodiments of the present disclosure; i.e., a left radial access right room setup peripheral interventional platform designed to allow a physician to perform lower extremity peripheral, heart catheterizations and pacemaker procedures while simultaneously reducing scatter radiation exposure to the cardiologist and the procedure staff such as the technologist. The purpose of the survey was to determine the percentage and effectiveness of the prototype to reduce scatter radiation levels to the cardiologist and the procedure staff.

[00045] Equipment and set-up. The x-ray unit used for the survey was a GE Innova 2100. Cardio mode was selected on the unit with indicated techniques of 60 kvp, 4 mA, 0.5 mm Cu filtration, and a field of view (FOV) of 20 cm. Radiation scatter readings were taken using a Victoreen and Inovision digital ion chamber in the exposure rate mode, using a five second exposure time. To duplicate a patient, a phantom consisting of a square plastic container with 23 cm of water was used as the radiation scatter medium.

[00046] Measurements and test results. The radiation measurements were made at the normal location [right side of operating table] for the cardiologist and the technologist with traditional radiation shielding in place and with the addition of the prototype. The radiation measurements were taken at each position at the following strategic body locations: eyes, chest, waist, and knees. Radiation measurements were also taken at five different C-arm angle positions typically used in heart catheterization procedures. As shown in detail in **FIGURE 11** (parts 11A and 11B), the test results indicated an overall exposure rate reduction to the technologist by 50.8% and to the cardiologist by 64.4%. More specifically, radiation reduction to the cardiologist at eye level was 39%; at chest level: 71.7%; at waist level: 76.7%; and at knee level: 70.45%. In short, radiation reduction exposure to attending staff may be reduced by between about thirty percent to about seventy-seven percent over a system that lacks the radiodense aspects described herein. Significantly reduced radiation exposure to procedure staff not only protects these professionals from unnecessary scatter radiation, but such reductions increase their procedure room longevity based on parameters mandated by federal and state radiation exposure limits.

[00047] While the present subject matter has been described in detail with respect to specific embodiments thereof, it will be appreciated that those skilled in the art, upon attaining an understanding of the foregoing may readily produce alterations to, variations of, and equivalents to such embodiments. Accordingly, the scope of the present disclosure is by way of example rather than by way of limitation, and the subject disclosure does not preclude inclusion of such modifications, variations and/or additions to the present subject matter as would be readily apparent to one of ordinary skill in the art.

THAT WHICH IS CLAIMED IS:

1. A left radial access, right room operation peripheral intervention system for use with an imaging system, the peripheral intervention system comprising:

a left radial base being configured to stabilize a left arm of a patient across a midsagittal plane of the patient during a lower extremity peripheral intervention on a procedure table;

a right radial base disposed substantially parallel to an operating surface of the procedure table, the right radial base being transradiant and configured to position a right arm of the patient in a direction away from the midsagittal plane during the lower extremity peripheral intervention; and

a radiation reduction barrier disposed substantially perpendicular to and spaced apart from the left radial base and from the right radial base, the radiation reduction barrier having a radiodense material disposed between the patient and an attending staff member to reduce scatter radiation from the patient in a direction of the staff member during a procedure.

2. The left radial access, right room operation peripheral intervention system as in Claim 1, wherein the left radial base includes a support surface for contacting the left arm.

3. The left radial access, right room operation peripheral intervention system as in Claim 2, further comprising a pad depending from the support surface.

4. The left radial access, right room operation peripheral intervention system as in Claim 1, further comprising a base board being configured to receive the right radial base, the left radial base and the radiation reduction barrier.

5. The left radial access, right room operation peripheral intervention system as in Claim 1, further comprising at least one radiodense apron in releasable connection proximate the operating table.

6. The left radial access, right room operation peripheral intervention system as in Claim 5, wherein the radiodense apron includes a plurality of pockets and respective radiodense inserts configured for insertion in the pockets.

7. The left radial access, right room operation peripheral intervention system as in Claim 5, wherein the radiodense apron and the radiation reduction barrier are disposed in a plane substantially parallel to each other.

8. The left radial access, right room operation peripheral intervention system as in Claim 7, wherein scatter radiation reduction exposure to an attending physician is reduced by at least sixty percent over a system without the radiodense apron and the radiation reduction barrier.

9. The left radial access, right room operation peripheral intervention system as in Claim 7, wherein scatter radiation reduction exposure to attending staff is reduced by between about thirty percent to about seventy-seven percent over a system omitting the radiodense apron and the radiation reduction barrier.

10. A left radial access, right room operation peripheral intervention system for use with an imaging system, the peripheral intervention system comprising:

a base board being configured for connection proximate a table having a left side and a right side corresponding to a left arm and a right arm of a patient;

a left radial base attached to the base board and being configured to cushion and stabilize a left arm of a cardiac patient across a midsagittal plane of the patient during a lower extremity peripheral intervention on the table, wherein an attending cardiologist may perform the intervention from the right side of the table; and

a radiation reduction barrier arranged vertically and spaced apart from the left radial base, the radiation reduction barrier having a radiodense material disposed between the patient and an attending staff member to reduce radiation scattering from the patient in a direction of the staff member.

11. The left radial access, right room operation peripheral intervention system as in Claim 10, further comprising a right radial base disposed substantially parallel to an operating surface of the table, the right radial base being transradiant and configured to position a right arm of the patient in a direction away from the midsagittal plane during the lower extremity peripheral intervention.

12. The left radial access, right room operation peripheral intervention system as in Claim 11, wherein the right radial base is attached to the base board.

13. The left radial access, right room operation peripheral intervention system as in Claim 10, further comprising at least one radiodense apron releasably connected to the base board.

14. A left radial access, right room operation peripheral intervention system for use with an imaging system, the peripheral intervention system comprising:

a base board being configured for attachment proximate a procedure table;

a left radial base attachable to the base board and being configured to stabilize a left arm of a patient across a midsagittal plane of the patient during a lower extremity peripheral intervention on the procedure table;

a right radial base attachable to the base board and disposed substantially parallel to an operating surface of the procedure table, the right radial base being transradiant and configured to position a right arm of the patient in a direction away from the midsagittal plane during the lower extremity peripheral intervention;

a radiation reduction barrier attachable to the base board and spaced apart from the left radial base and from the right radial base, the radiation reduction barrier having a radiodense material disposed substantially vertically between the patient and an attending staff member to reduce radiation scattering from the patient in a direction of the staff member during an imaging procedure; and

a radiodense apron releasably connected to the base board.

15. The left radial access, right room operation peripheral intervention system as in Claim 14, wherein the radiation reduction barrier includes radiation attenuating material being configured for extension.

16. The left radial access, right room operation peripheral intervention system as in Claim 14, wherein the radiodense apron includes a plurality of sleeves and respective radiodense material inserts.

17. The left radial access, right room operation peripheral intervention system as in Claim 14, further comprising at least two radiodense aprons.

18. A left radial access, right room operation peripheral intervention system for use with an imaging system, the peripheral intervention system comprising:

a right radial base having a base board attachable to a procedure table with a right side and a left side corresponding to a right arm and a left arm of a patient, the right radial base being disposed substantially parallel to an operating surface of the operating table, the right radial base board being disposed under the operating surface, the right radial base being transradiant and configured to position the right arm of the patient in a direction away from the midsagittal plane during the lower extremity peripheral intervention;

a left radial base in connection with the right radial base board and being configured to stabilize a left arm of a patient across a midsagittal plane of the patient during a lower extremity peripheral intervention on the procedure table;

a radiation reduction barrier attachable to a right radial base board under the table surface, the radiation reduction barrier spaced apart from the left radial base and from the right radial base, the radiation reduction barrier having a radiodense material disposed between the patient and an attending staff member to reduce radiation scattering from the patient in a direction of the staff member during an imaging procedure; and

a radiodense apron releasably connected to the base board.

19. The left radial access, right room operation peripheral intervention system as in Claim 18, wherein the radiodense apron includes at least two radiodense aprons, at least one apron movable relative to the other.

20. A method for left radial access and right room operation peripheral intervention system comprising:

joining a left radial base proximate a procedure table having a left side corresponding to a left arm of a patient and a right side corresponding to right arm of a patient;

stabilizing the left arm of a patient across a midsagittal plane of the patient with the left radial base;

joining a radiation reduction barrier proximate the right side of the procedure table spaced apart from the left radial base, the radiation reduction barrier having a radiodense material disposed substantially vertically between the patient and an attending staff member; and

performing a lower extremity peripheral intervention on the procedure table through the left arm of the patient from the right side of the operating table.

21. The method as in Claim 20, further comprising joining a base board proximate the procedure table and attaching at least one of the left radial base and the radiation reduction barrier to the base board.

22. The method as in Claim 20, further comprising joining a radiation reduction curtain proximate the operating table.

23. The method as in Claim 22, further comprising reducing radiation scattering from the patient in a direction of the staff member by at least sixty percent over a system lacking the radiation reduction barrier the radiation reduction curtain.

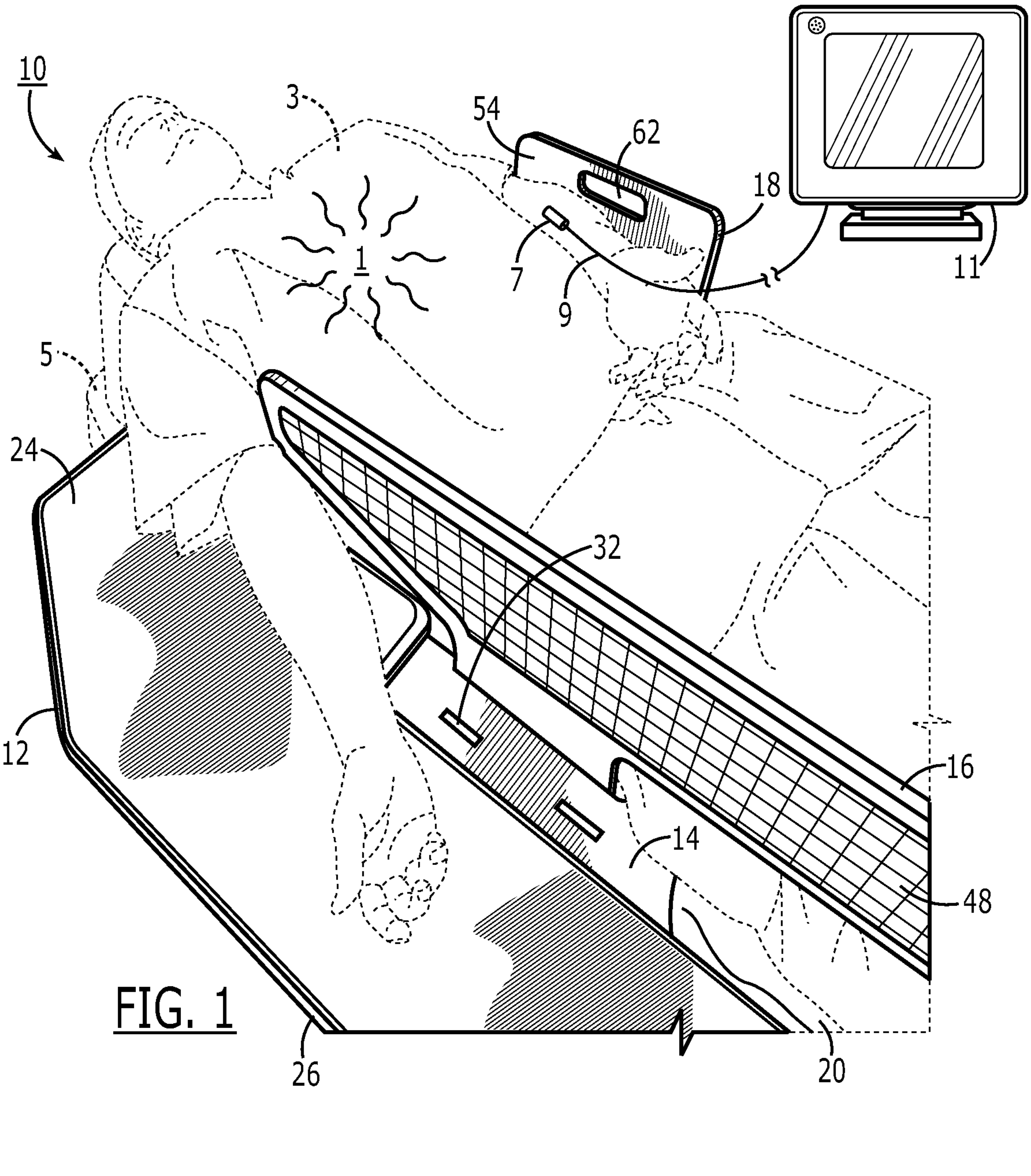

FIG. 1

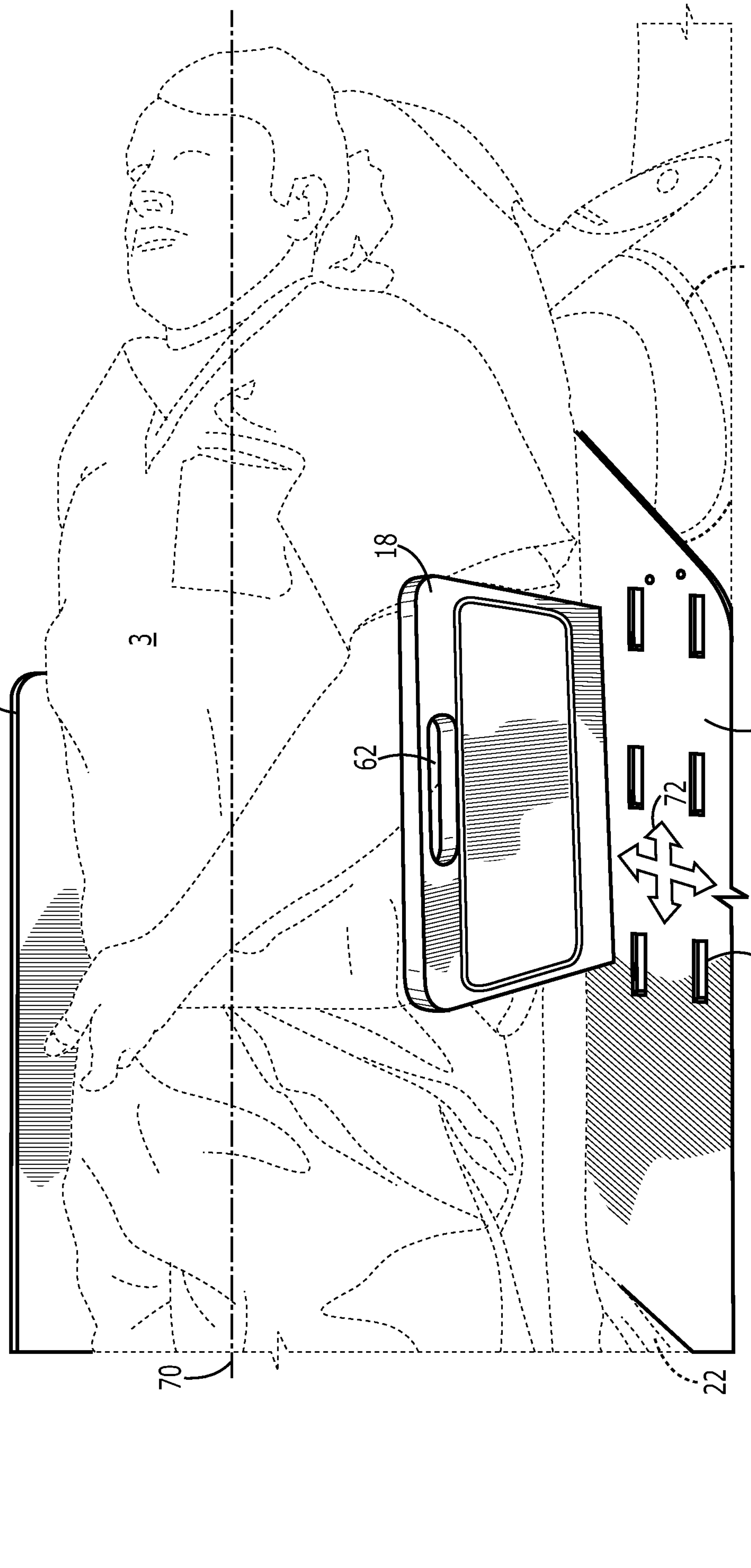

FIG. 2

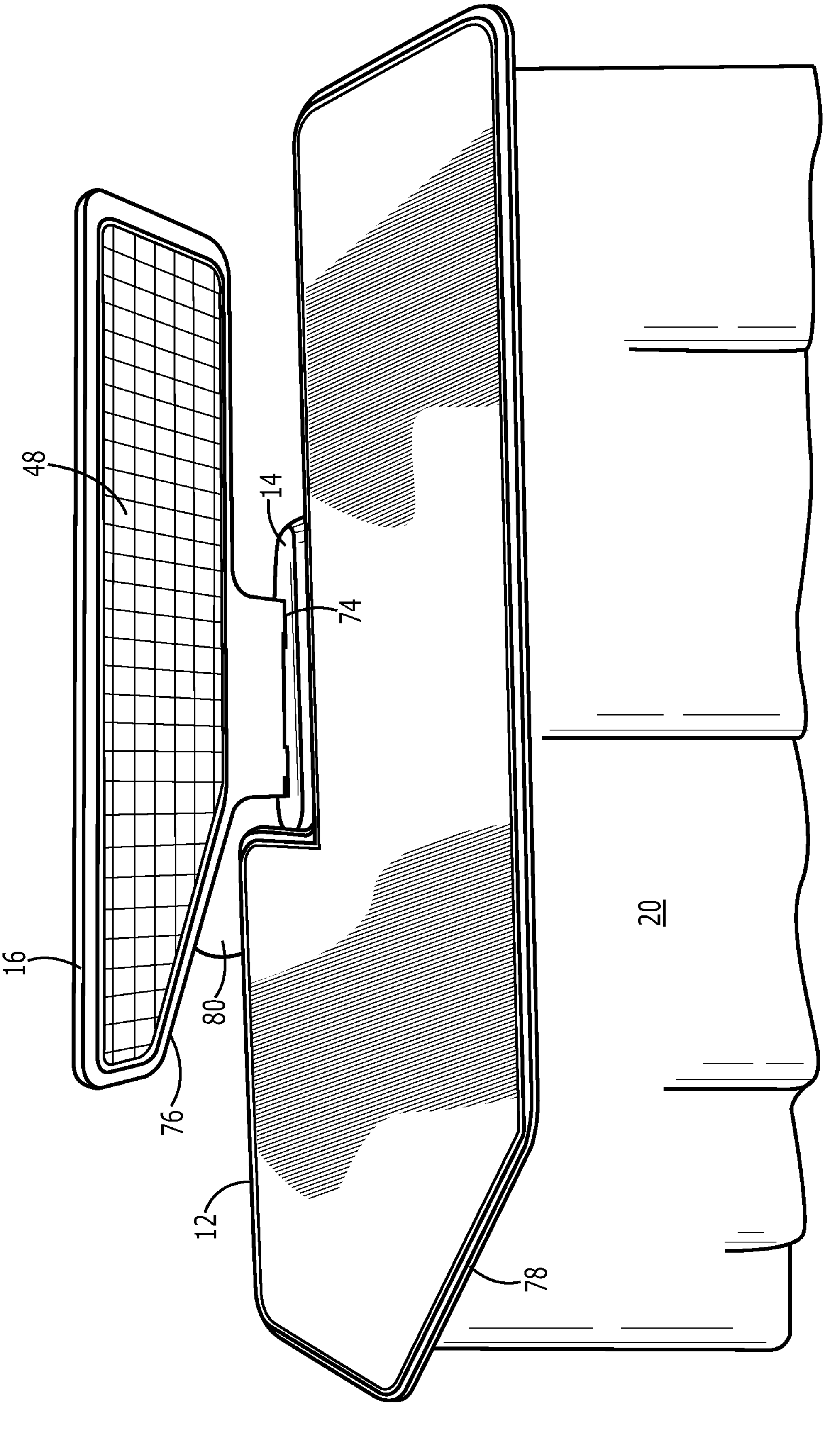

FIG. 3

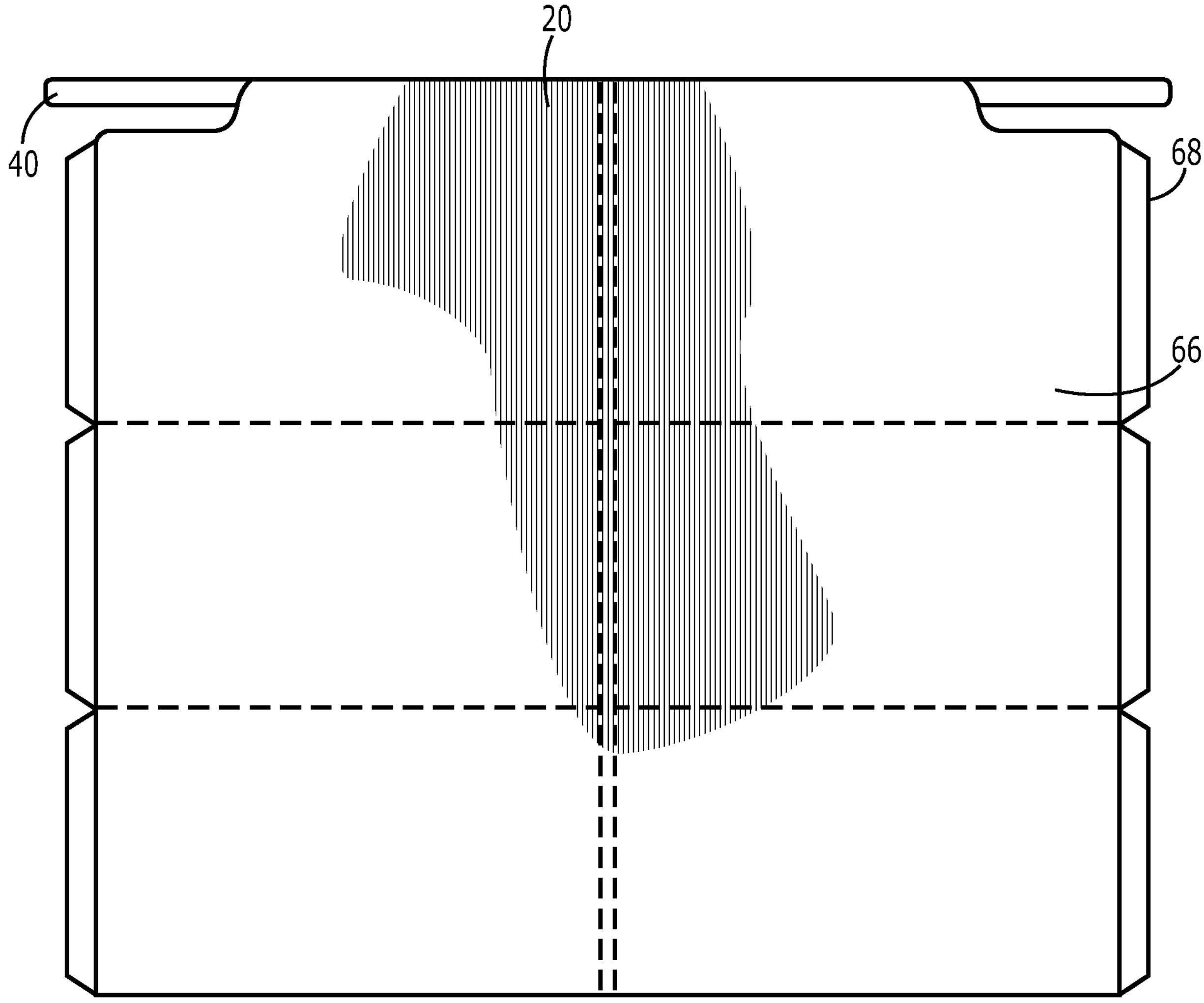

FIG. 4

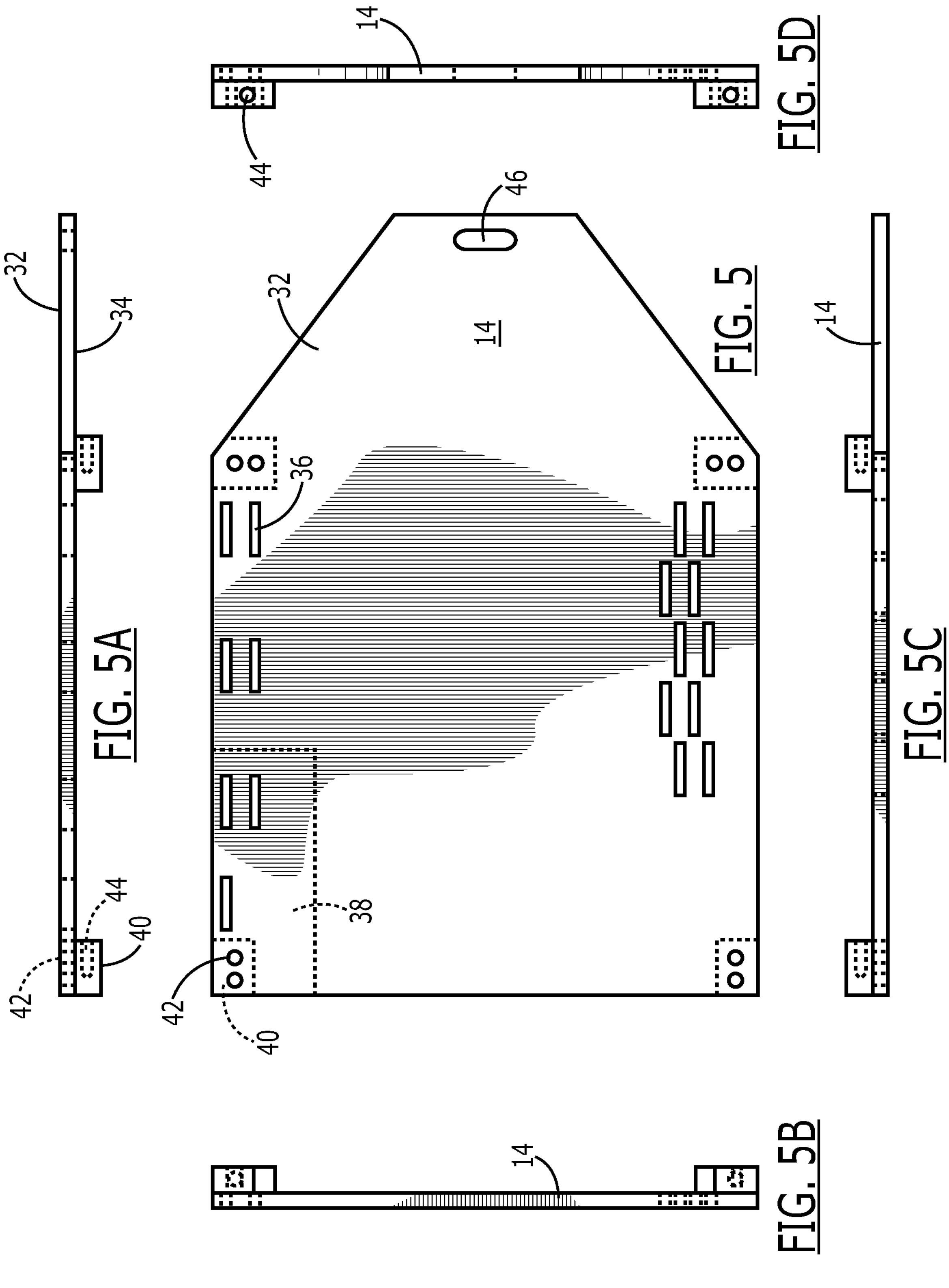

FIG. 5D

FIG. 5A

FIG. 5

FIG. 5C

FIG. 5B

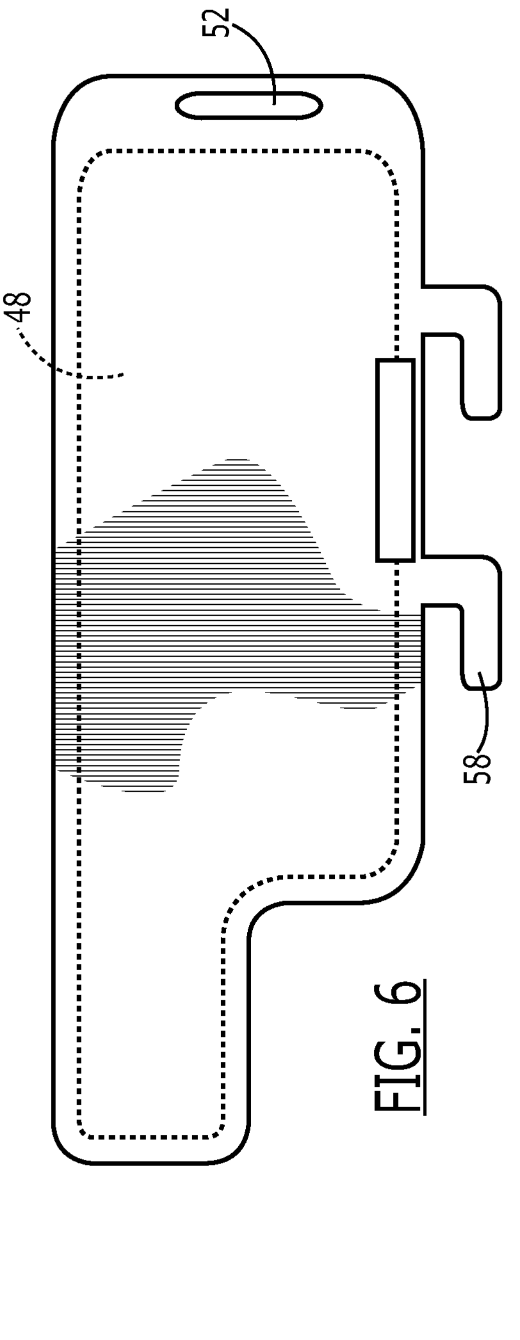

FIG. 6

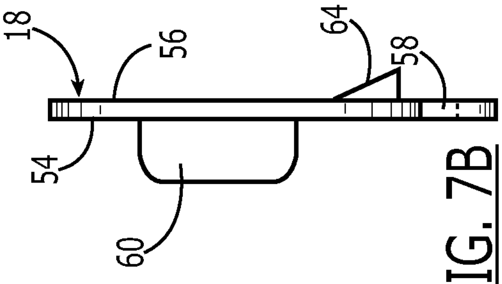

FIG. 7B

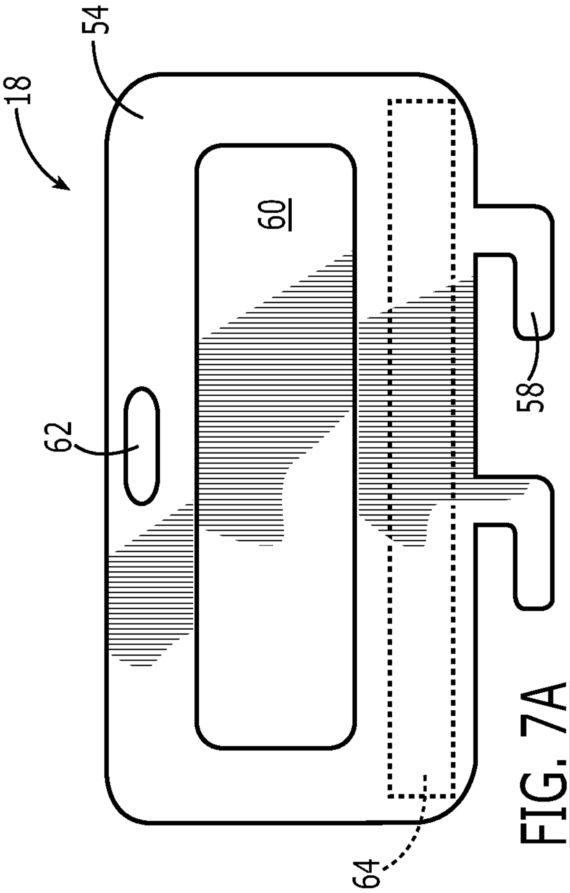

FIG. 7A

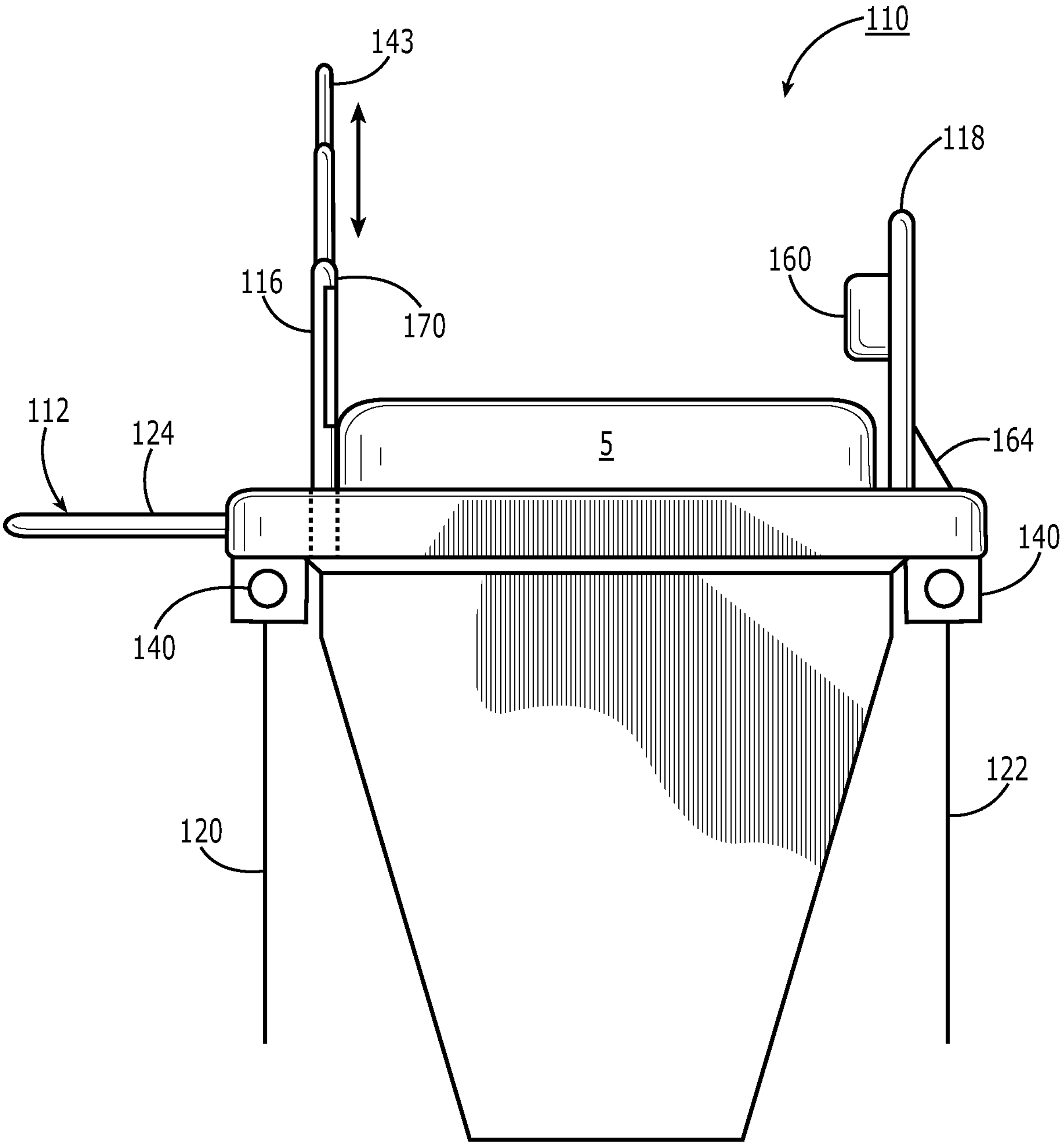

FIG. 8

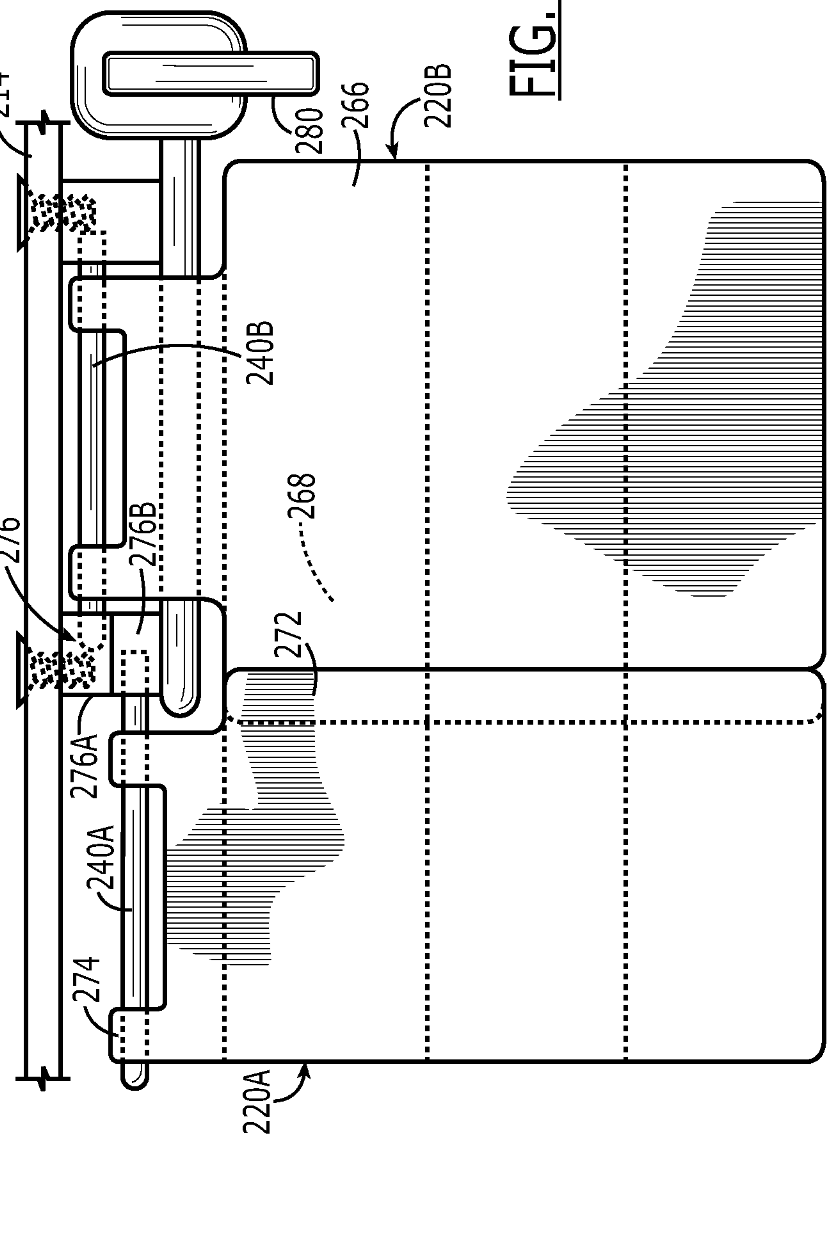
214
276
276B
240B
266
220B
280
268
272
276A
240A
274
220A

FIG. 9

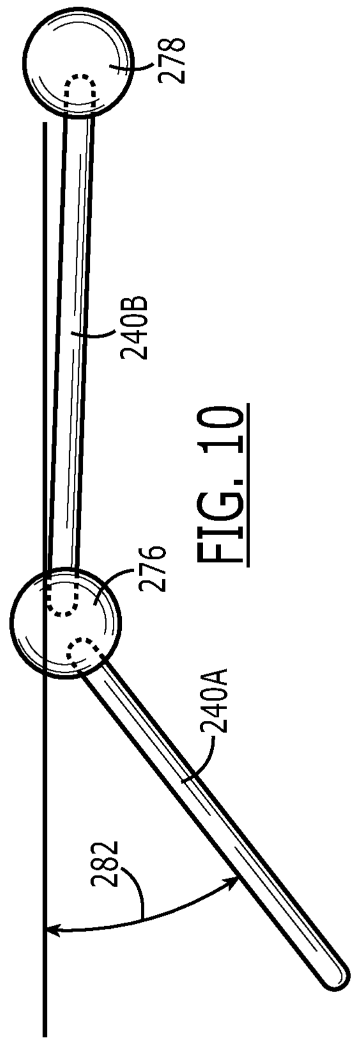
278
240B
276
240A
282

FIG. 10

Standard Shielding		Cardiologist		
Position 1=Eyes	Position 2=Chest	Position 3=Waist	Position 4=Knees	
100 mR/hr	95 mR/hr	50 mR/hr	50 mR/hr	A/P (0.0)
100 mR/hr	118 mR/hr	54 mR/hr	11.4 mR/hr	RAO 36 CRA 21
96 mR/hr	153 mR/hr	110 mR/hr	3.8 mR/hr	LAO 33 CRA 21
97.2 mR/hr	168 mR/hr	70.1 mR/hr	17.8 mR/hr	LAO 31 CAU 30
13.5 mR/hr	4.4 mR/hr	32 mR/hr	4.8 mR/hr	RAO 28 CAU 0
81.7 mR/hr	**107.7 mR/hr**	**63.2 mR/hr**	**17.6 mR/hr**	**Average mR/hr**
Added Shielding		Cardiologist		
29 mR/hr	22 mR/hr	16.2 mR/hr	3.8 mR/hr	A/P (0.0)
101 mR/hr	35 mR/hr	16.3 mR/hr	7.3 mR/hr	RAO 36 CRA 21
46 mR/hr	21 mR/hr	12.3 mR/hr	2.9 mR/hr	LAO 22 CRA 21
45 mR/hr	61 mR/hr	21.2 mR/hr	8.7 mR/hr	LAO 31 CAU 30
28 mR/hr	13.2 mR/hr	7.9 mR/hr	3.4 mR/hr	RAO 28 CAU 0
49.8 mR/hr	**30.4 mR/hr**	**14.7 mR/hr**	**5.2 mR/hr**	**Average mR/hr**
39%	**71.70%**	**76.70%**	**70.45%**	**Cardiologist Reduction**

Techniques	
EVP	60
mA	40
Exposure Time	5 Seconds
FOV	20 cm
Table Height	36 in
S/O	100 cm
Phantom	21 cm Water
Distance from center of Phantom to Cardiologist	25 in
Distance from center of Phantom to Technologist	44 in
Meters Used	Inovison 451-P Victoreen 451-P RYR
Mode	Exposure Rate

64.4% Average

to Fig. 11B

FIG. 11A

Fig. 11A
Fig. 11B

FIG. 11

from Fig. 11A

Standard Shielding		Cardiologist			
28 mR/hr	30 mR/hr	16 mR/hr	27 mR/hr	A/P (0.0)	
70 mR/hr	63 mR/hr	15 mR/hr	14.1 mR/hr	RAO 36 CRA 21	
75 mR/hr	70 mR/hr	14.2 mR/hr	18.4 mR/hr	LAO 33 CRA 21	
42.5 mR/hr	45 mR/hr	13.1 mR/hr	15.9 mR/hr	LAO 31 CAU 30	
29 mR/hr	27 mR/hr	7 mR/hr	5.7 mR/hr	RAO 28 CAU 0	
49.8 mR/hr	**47 mR/hr**	**13.1 mR/hr**	**16.2 mR/hr**	**Average mR/hr**	
Added Shielding		Cardiologist			
17.5 mR/hr	5.9 mR/hr	3.6 mR/hr	3.4 mR/hr	A/P (0.0)	
85 mR/hr	17.7 mR/hr	10.3 mR/hr	8.4 mR/hr	RAO 36 CRA 21	
36 mR/hr	11.4 mR/hr	6.3 mR/hr	9.8 mR/hr	LAO 22 CRA 21	
22 mR/hr	9.8 mR/hr	6.7 mR/hr	4.5 mR/hr	LAO 31 CAU 30	
30 mR/hr	11.8 mR/hr	11.8 mR/hr	2.7 mR/hr	RAO 28 CAU 0	
38.1 mR/hr	**11.1 mR/hr**	**7.7 mR/hr**	**5.8 mR/hr**	**Average mR/hr**	
22%	**75.7%**	**40.9%**	**64.8%**	**Technologist Reduction**	**50.8% Average**

FIG. 11B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US14/34788

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A61G 13/12 (2014.01)
CPC - A61G 13/12, 13/1235
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)
IPC(8): A61G 13/10, 13/12; A61B 6/10 (2014.01)
CPC: A61G 13/10, 13/101, 13/12, 13/1235; A61B 6/10

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)
MicroPatent (US-G, US-A, EP-A, EP-B, WO, JP-bib, DE-C,B, DE-A, DE-T, DE-U, GB-A, FR-A); Google Scholar; ProQuest Dialog; Medline/PubMed; Espacenet: access, arm, barrier, base, intervention, left , midsagittal , peripheral, plane, platform, position, procedure , radial , radiation, screen, stabilize, support, system, table

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2013/089608 A1 (EKDAHL, P) June 20, 2013; page 2, line 34; page 3 lines 35-37; page 4, lines 1-11	1-23
A	US 7103932 B1 (KANDORA, JM) September 12, 2006; figure 1; column 2; lines 6-10, 23-25, 57-58; column 4, lines 1-3	1-23
A	US 2011/0184278 A1 (GOFF, G, et al.) July 28, 2011; figure 14; paragraphs [0023], [0029], [0040], [0043]	1-23
A	US 2005/0235421 A1 (ANSEL, GM) October 27, 2005; figure 4; paragraph [0034]	1-23
A	US 2003/0167569 A1 (NEWKIRK, A, et al.) September 11, 2003; entire document	1-23

☐ Further documents are listed in the continuation of Box C. ☐

* 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
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"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
19 September 2014 (19.09.2014)	09 OCT 2014

Name and mailing address of the ISA/US	Authorized officer:
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Shane Thomas PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774