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Taracila et al.

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(54) **FLEXIBLE IN BORE RECEIVING COIL ARRAY FOR A MAGNETIC RESONANCE IMAGING SYSTEM**

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(51) **Int. Cl.**

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A61B 5/00	(2006.01)
A61B 5/055	(2006.01)
G01R 33/3415	(2006.01)

(52) **U.S. Cl.**

CPC ***G01R 33/34084*** (2013.01); ***A61B 5/055*** (2013.01); ***A61B 5/704*** (2013.01); ***G01R 33/3415*** (2013.01)

(58) **Field of Classification Search**

CPC G01R 33/34084; G01R 33/3415; G01R 33/48; G01R 33/34; A61B 5/055; A61B 5/704

See application file for complete search history.

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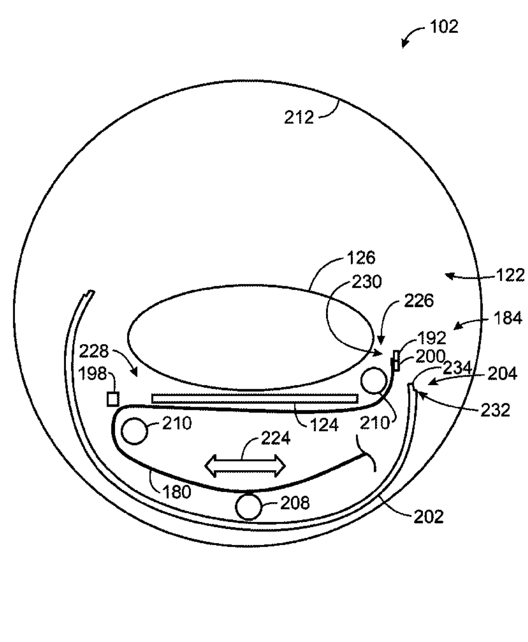
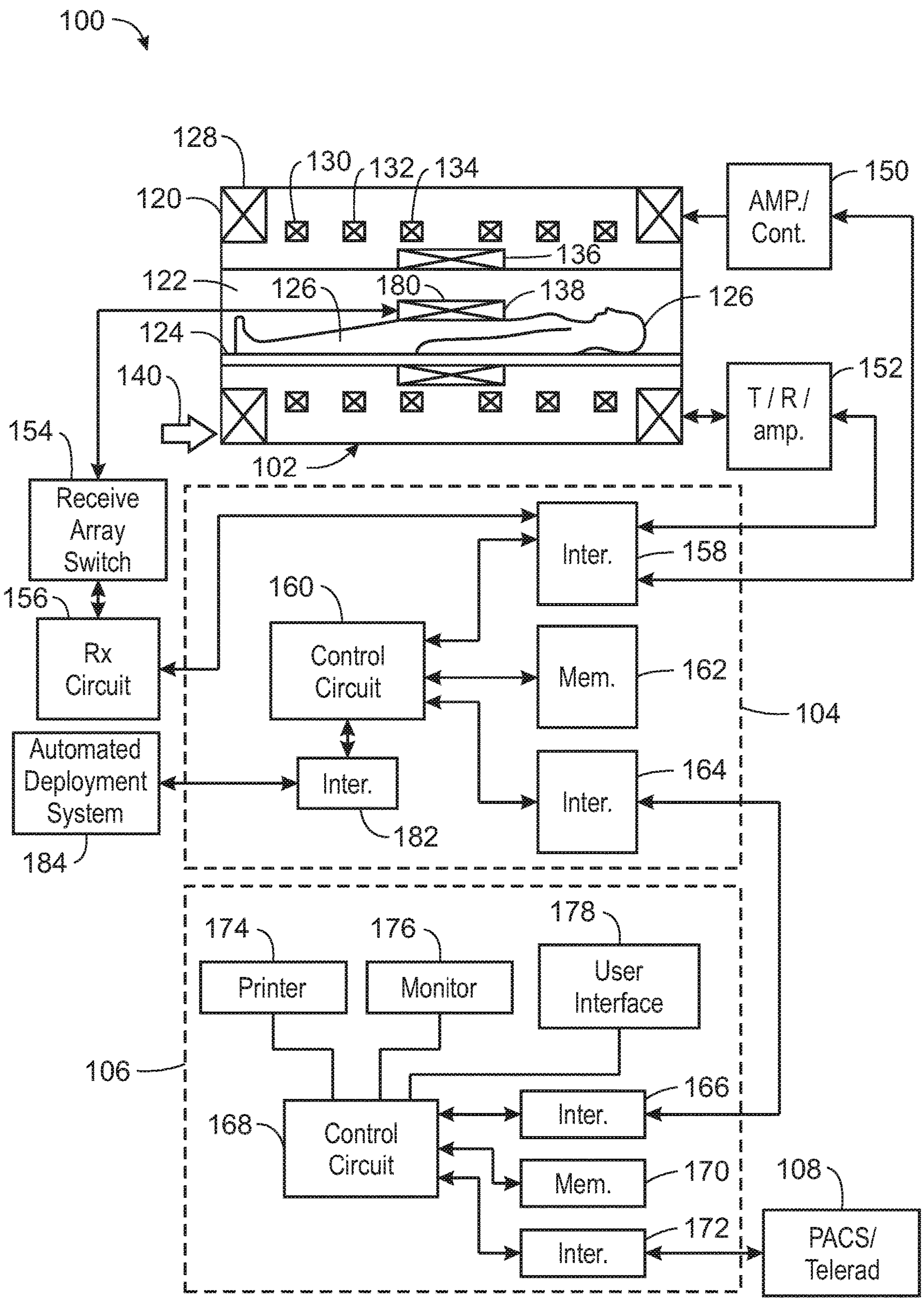
(57) **ABSTRACT**

An MRI system includes an MRI scanner having a bore and a table configured to move a subject to be imaged into and out of the bore. The MRI system includes a flexible RF receiving coil array integrated within the bore and electronically coupled directly to the MRI scanner, wherein the flexible RF receiving coil array remains in the bore regardless of a position of the table, and the flexible RF receiving coil array is located underneath the table when the table is located within the bore. The MRI system includes an automated mechanism configured to automatically move the flexible RF receiving coil array from underneath the table on a first side of the subject, to pull the flexible RF receiving coil array over the subject from the first side to a second side of the subject, and to fasten the flexible RF receiving coil on the second side.

20 Claims, 15 Drawing Sheets

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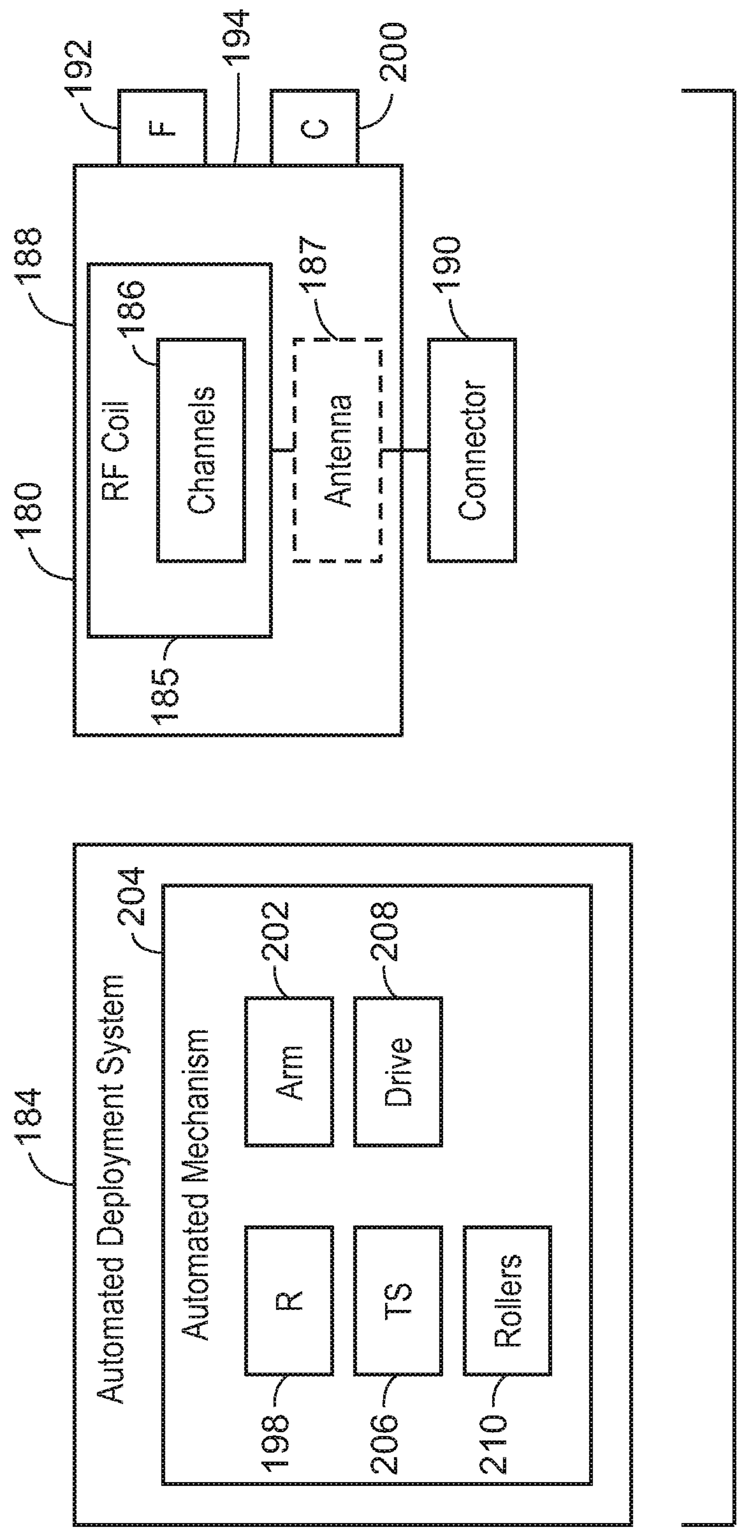
Inter.
PACS/
Telerad

FIG. 1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Antenna
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Automated Deployment System
204
Automated Mechanism
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Arm
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Drive
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TS
Rollers
198
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210

FIG. 2

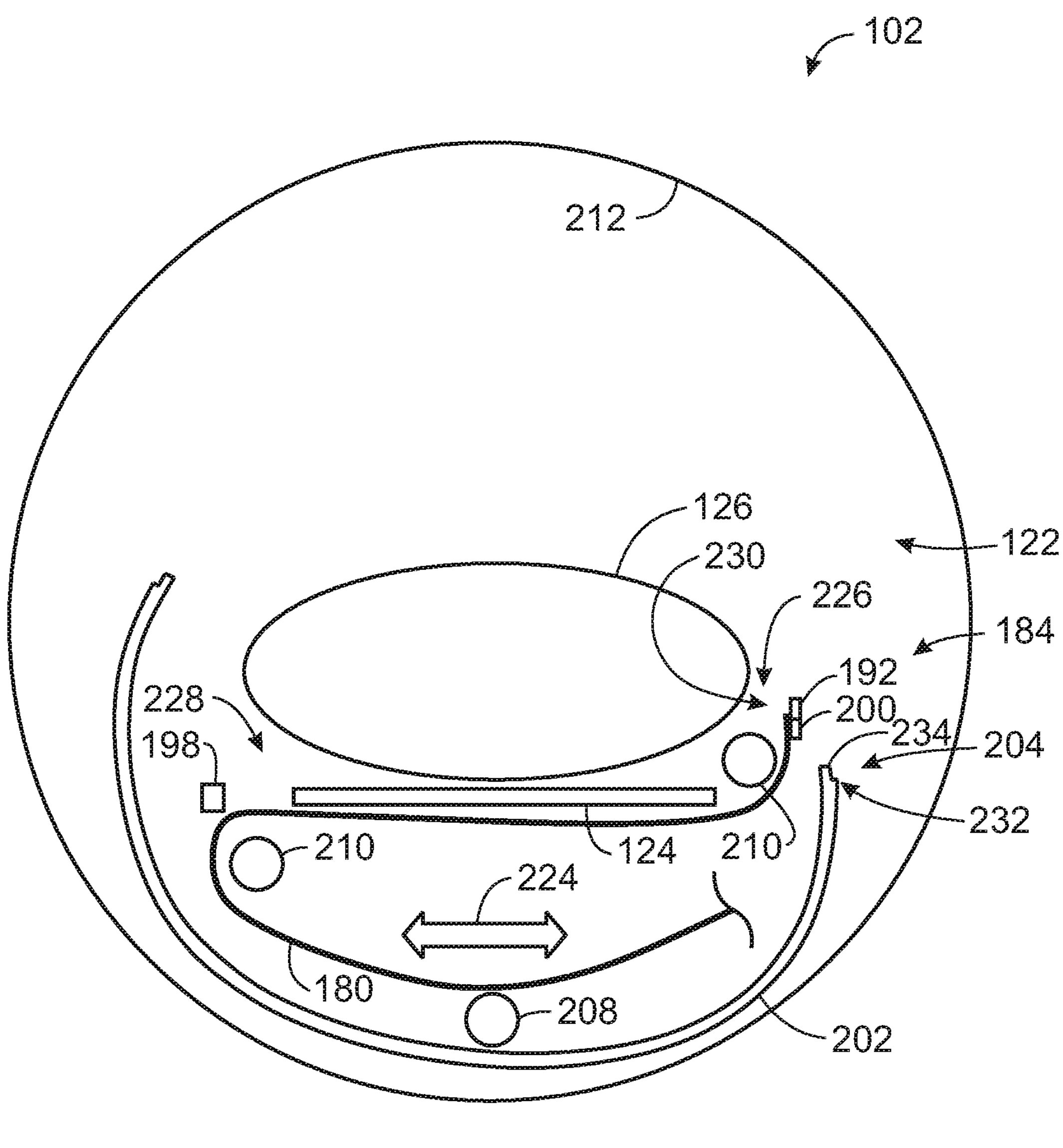
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FIG. 3

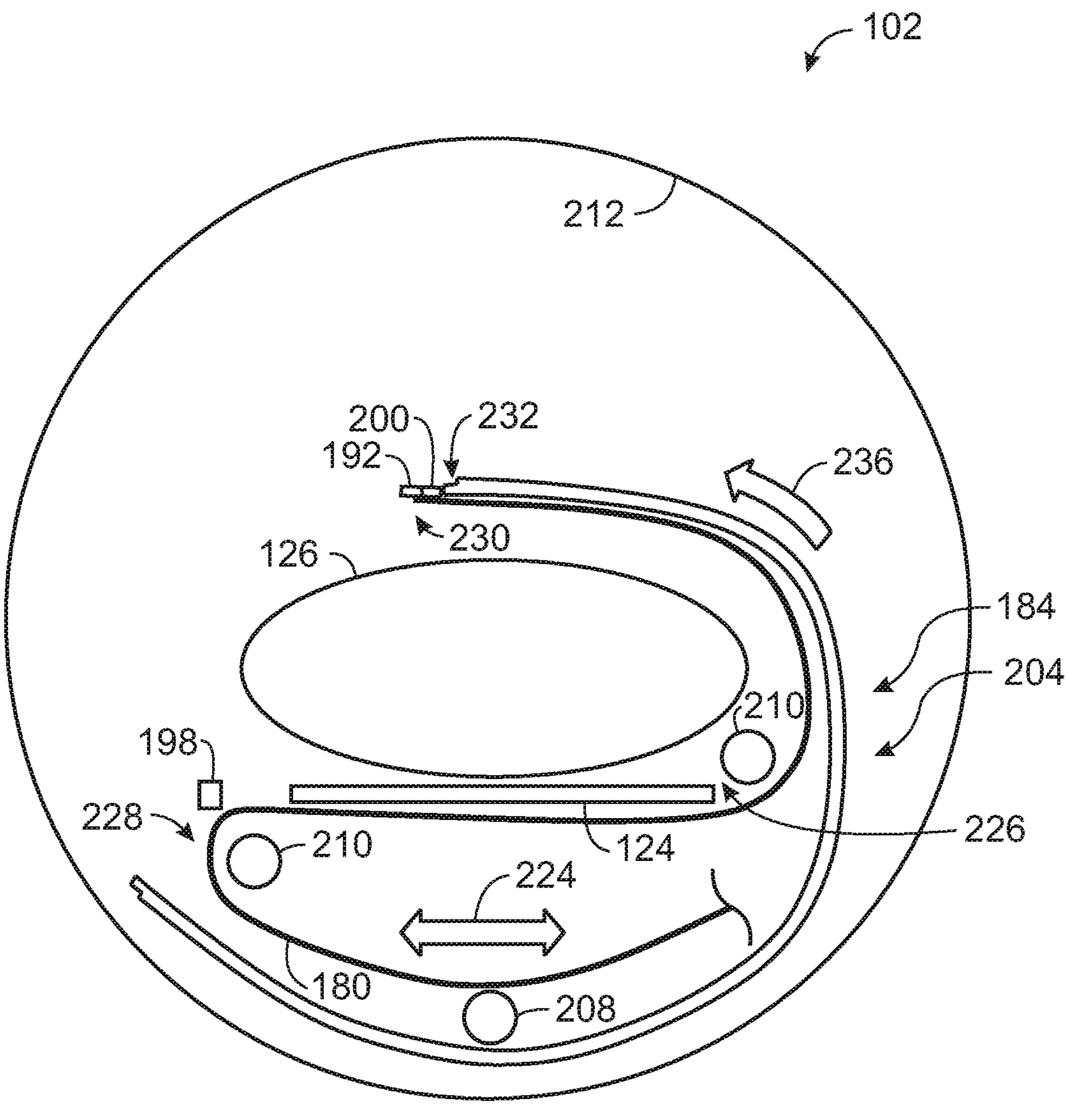
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FIG. 4

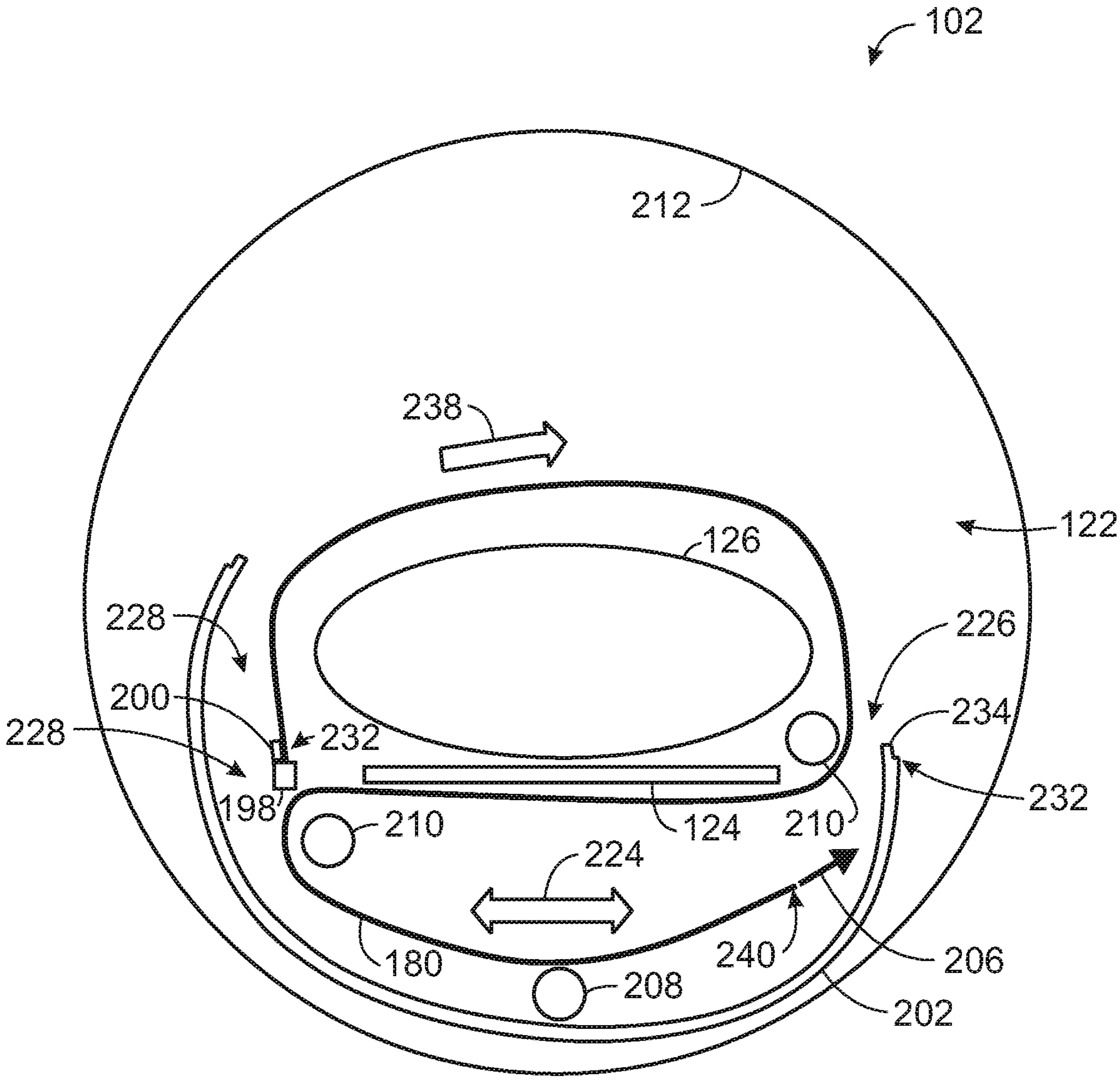
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FIG. 5

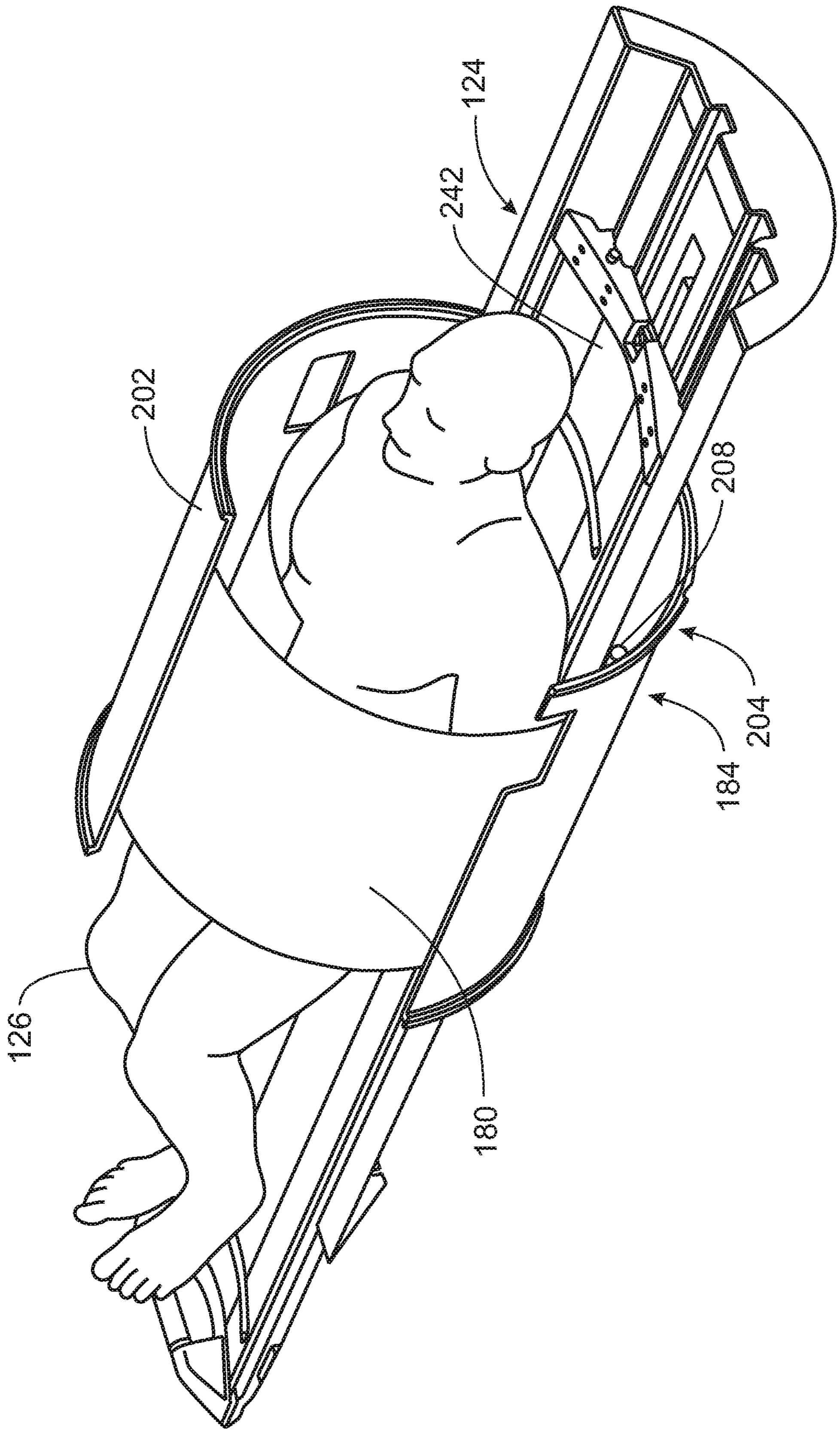

FIG. 6

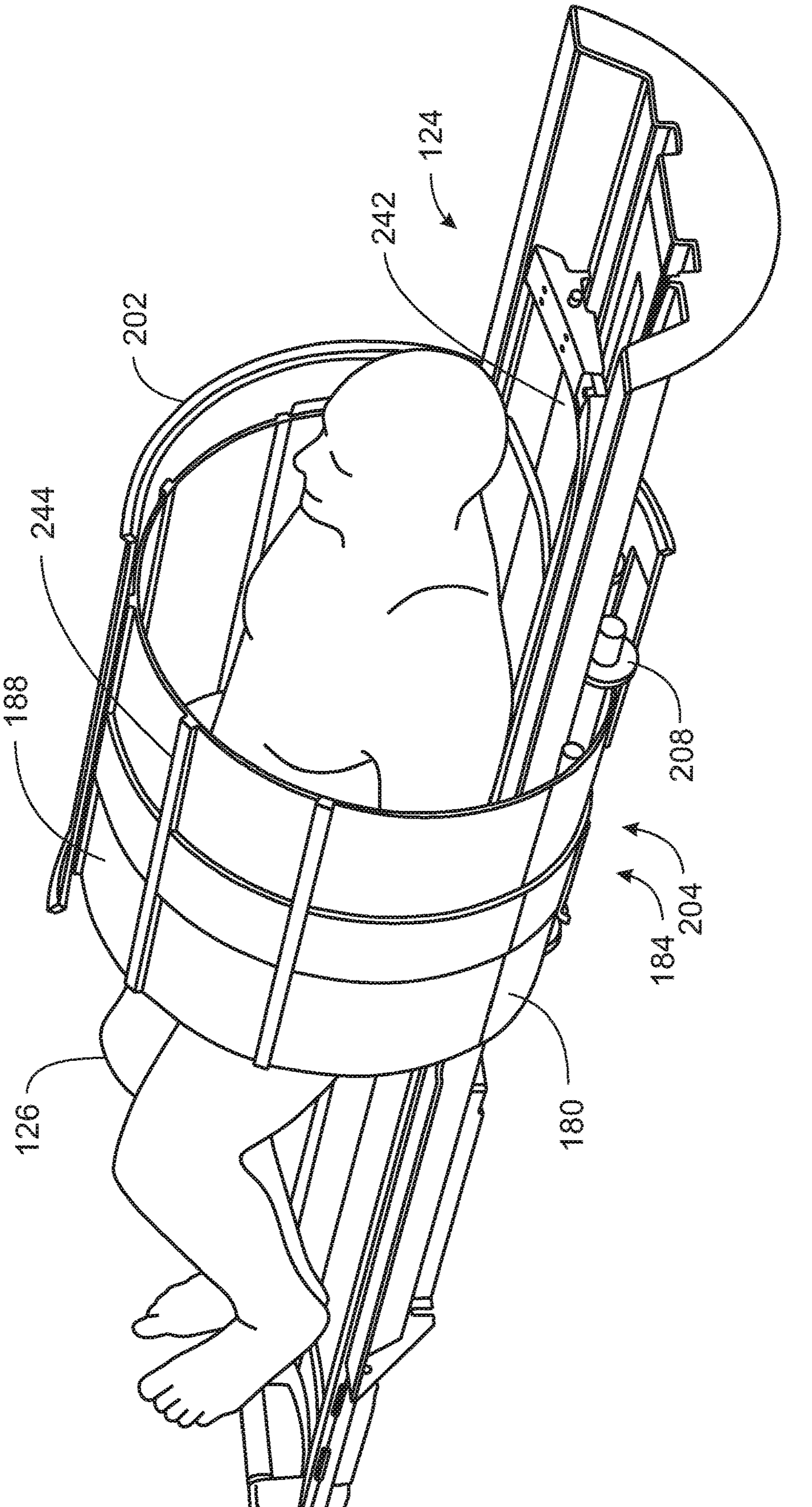

FIG. 7

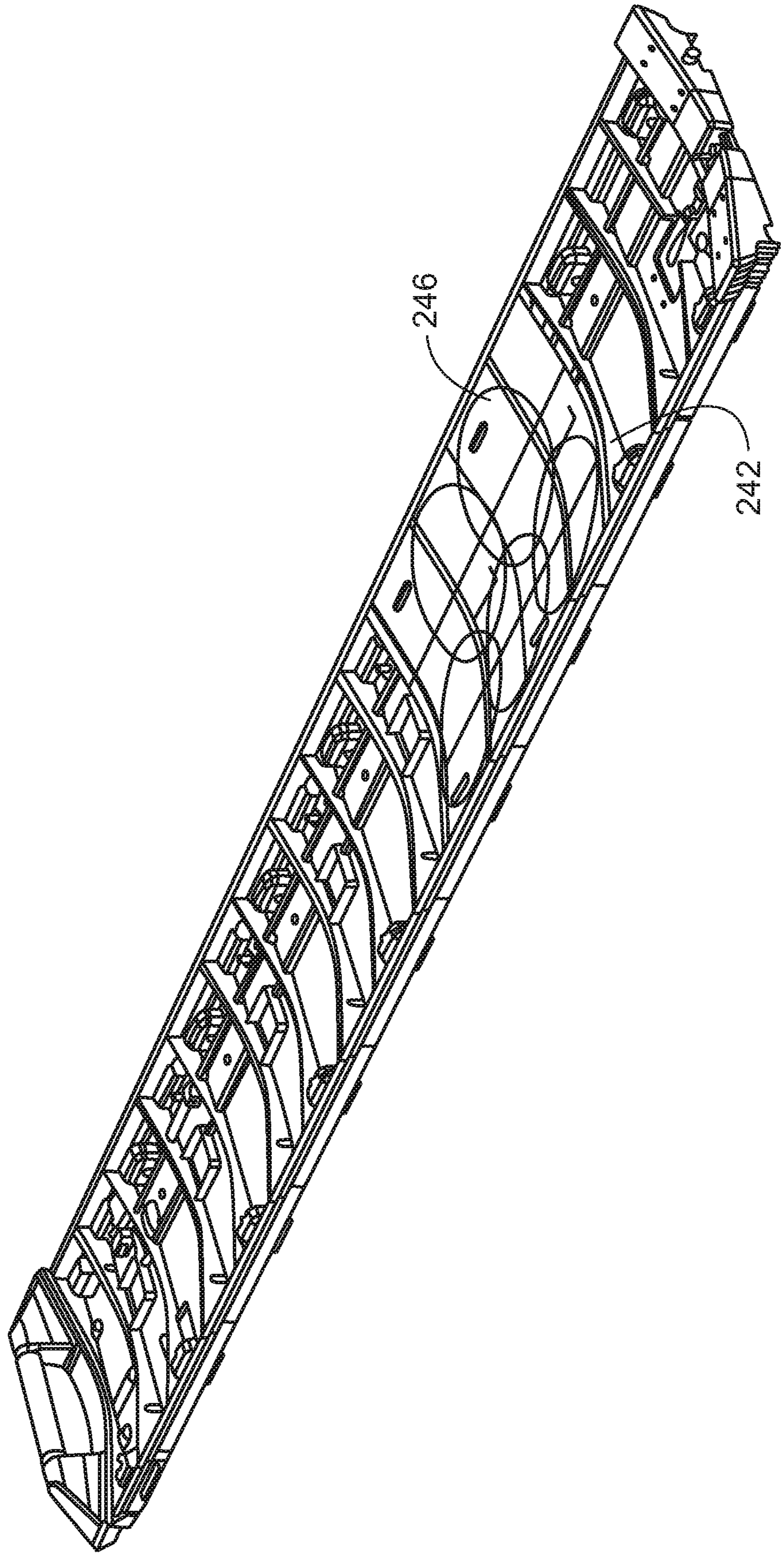

FIG. 8

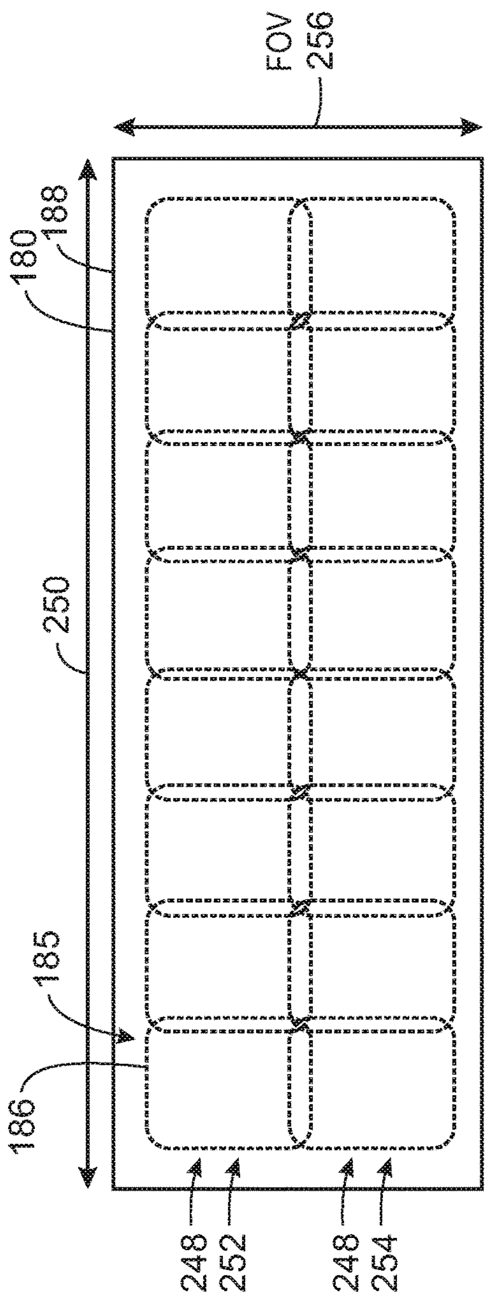
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FIG. 9

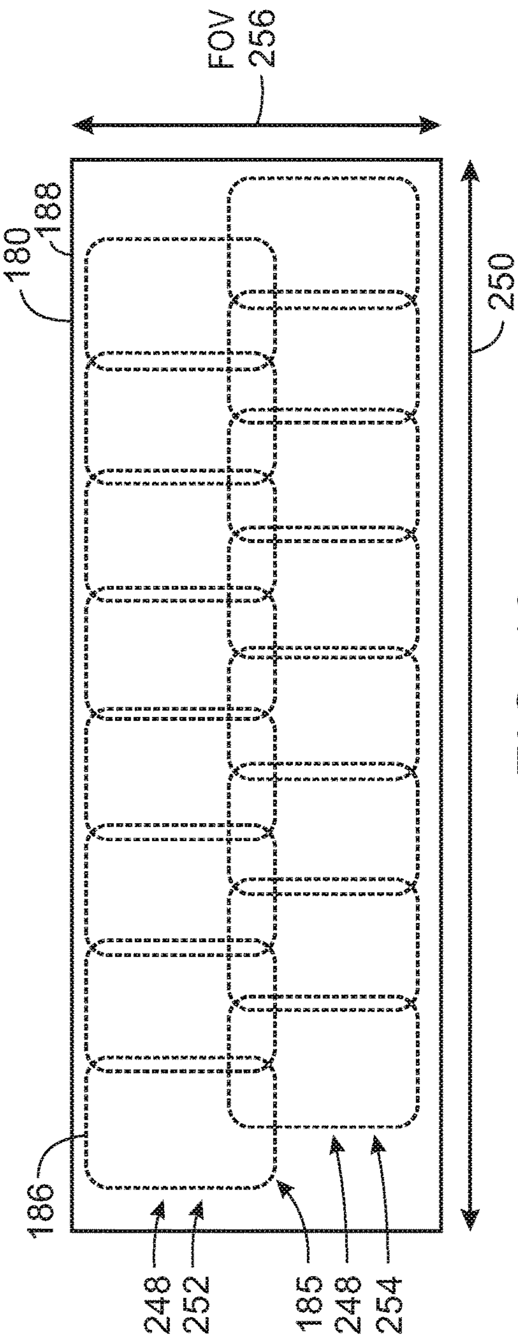
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FIG. 10

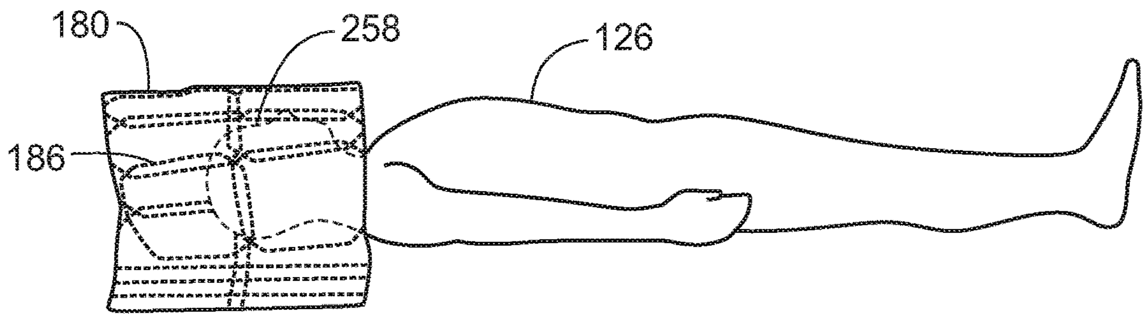

FIG. 11A

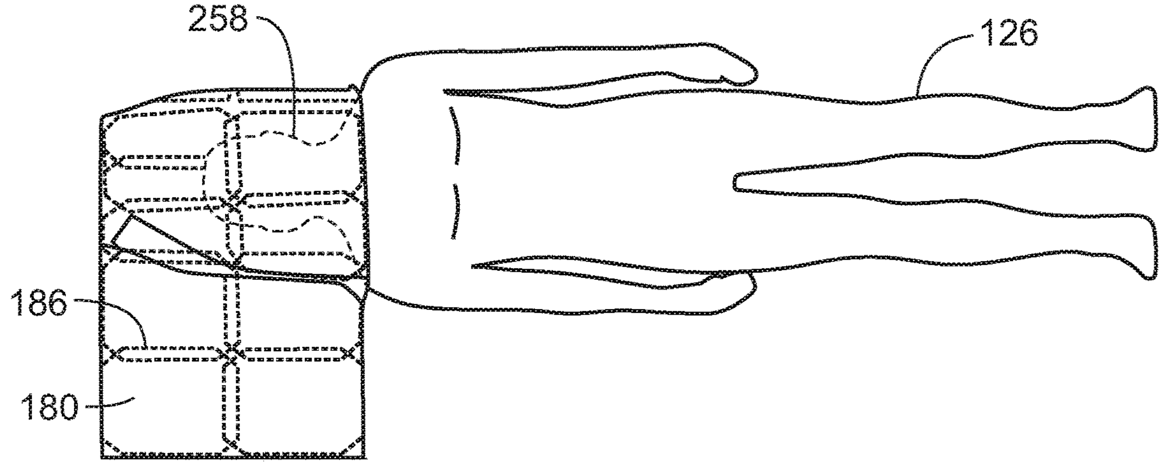

FIG. 11B

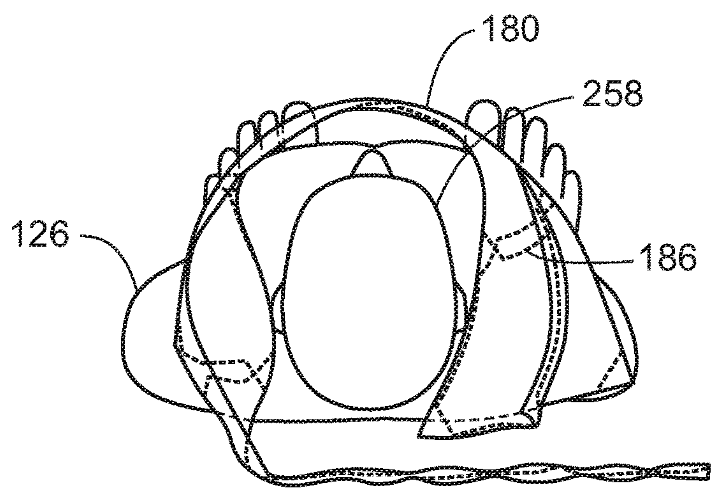

FIG. 11C

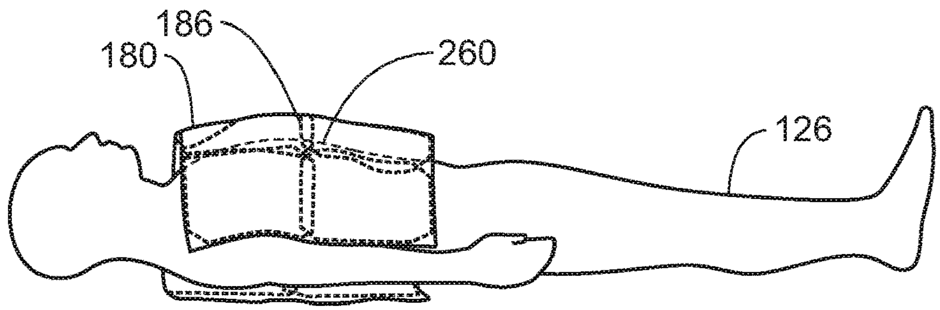

FIG. 12A

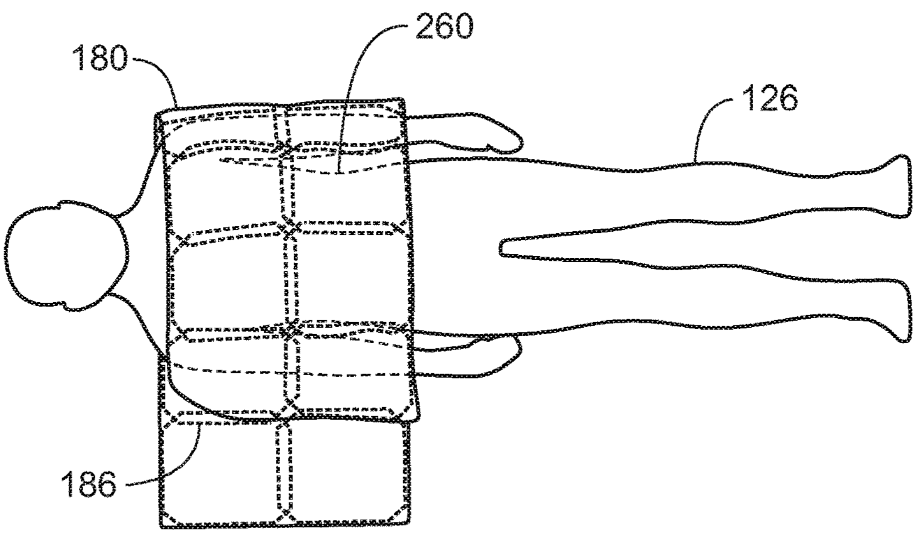

FIG. 12B

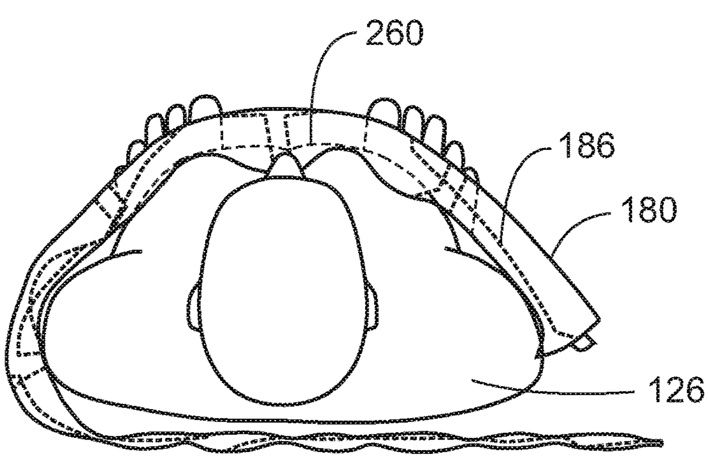

FIG. 12C

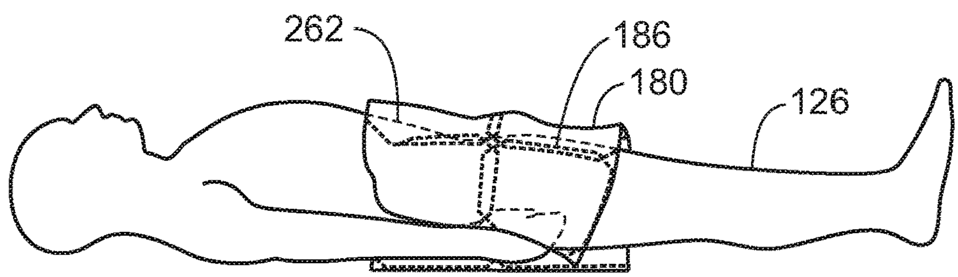

FIG. 13A

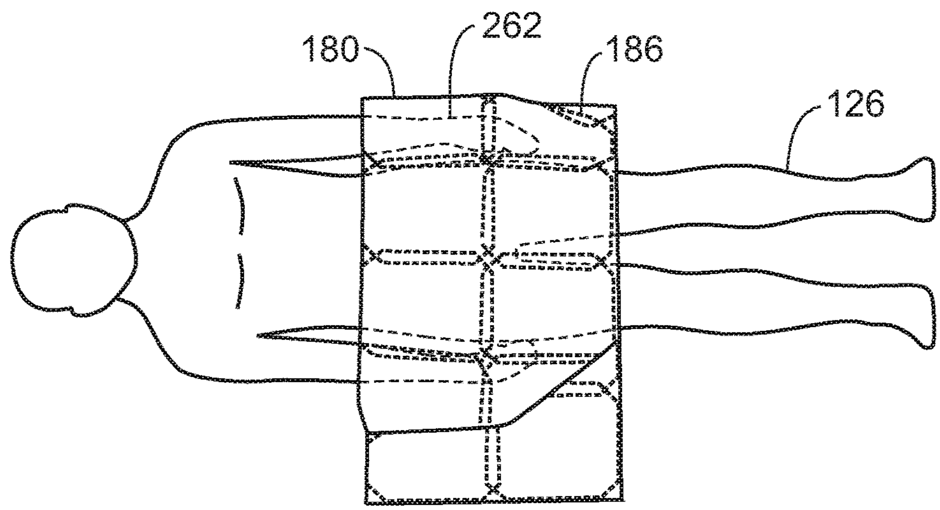

FIG. 13B

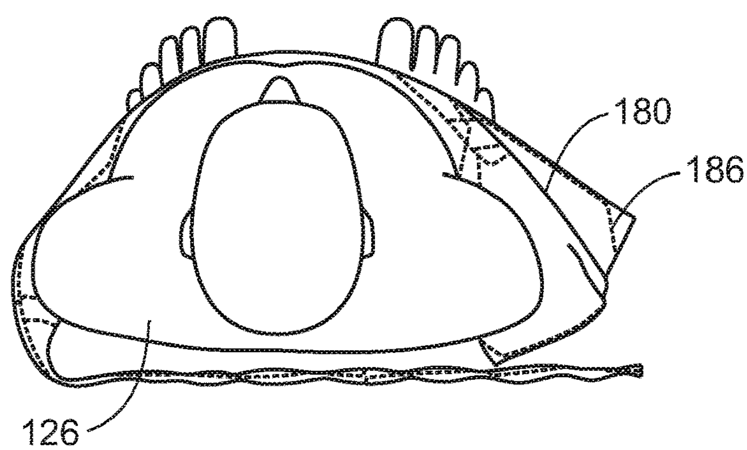

FIG. 13C

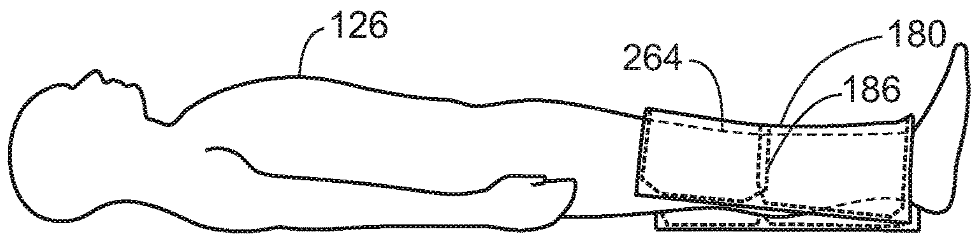

FIG. 14A

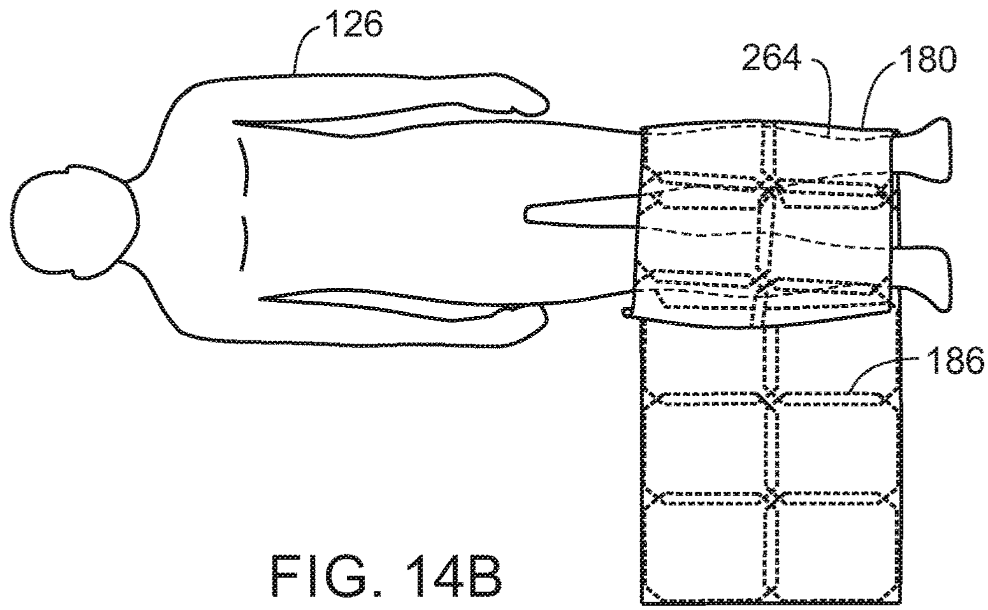

FIG. 14B

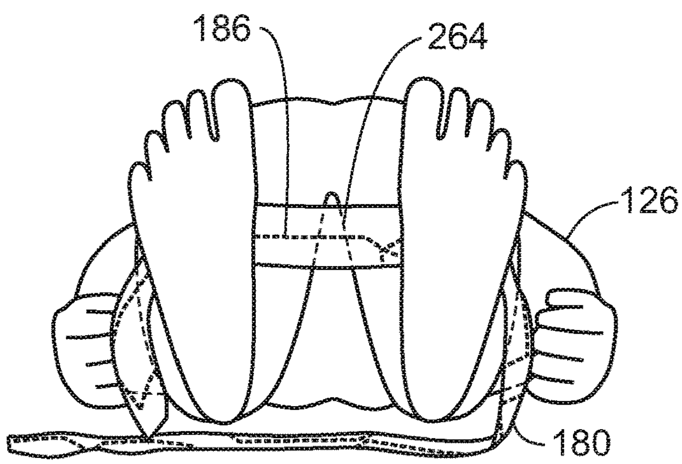

FIG. 14C

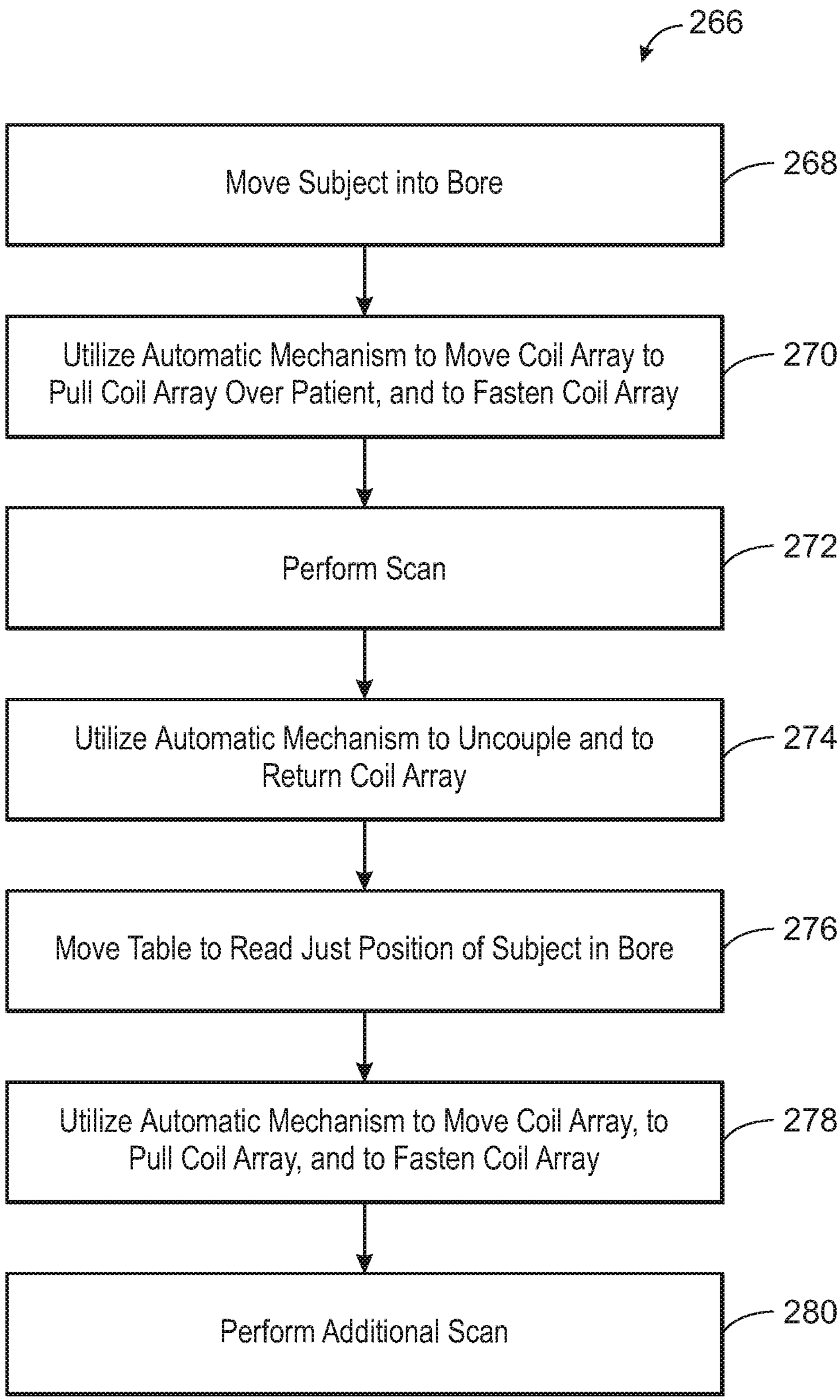
266
Move Subject into Bore
268
Utilize Automatic Mechanism to Move Coil Array to Pull Coil Array Over Patient, and to Fasten Coil Array
270
Perform Scan
272
Utilize Automatic Mechanism to Uncouple and to Return Coil Array
274
Move Table to Read Just Position of Subject in Bore
276
Utilize Automatic Mechanism to Move Coil Array, to Pull Coil Array, and to Fasten Coil Array
278
Perform Additional Scan
280

FIG. 15

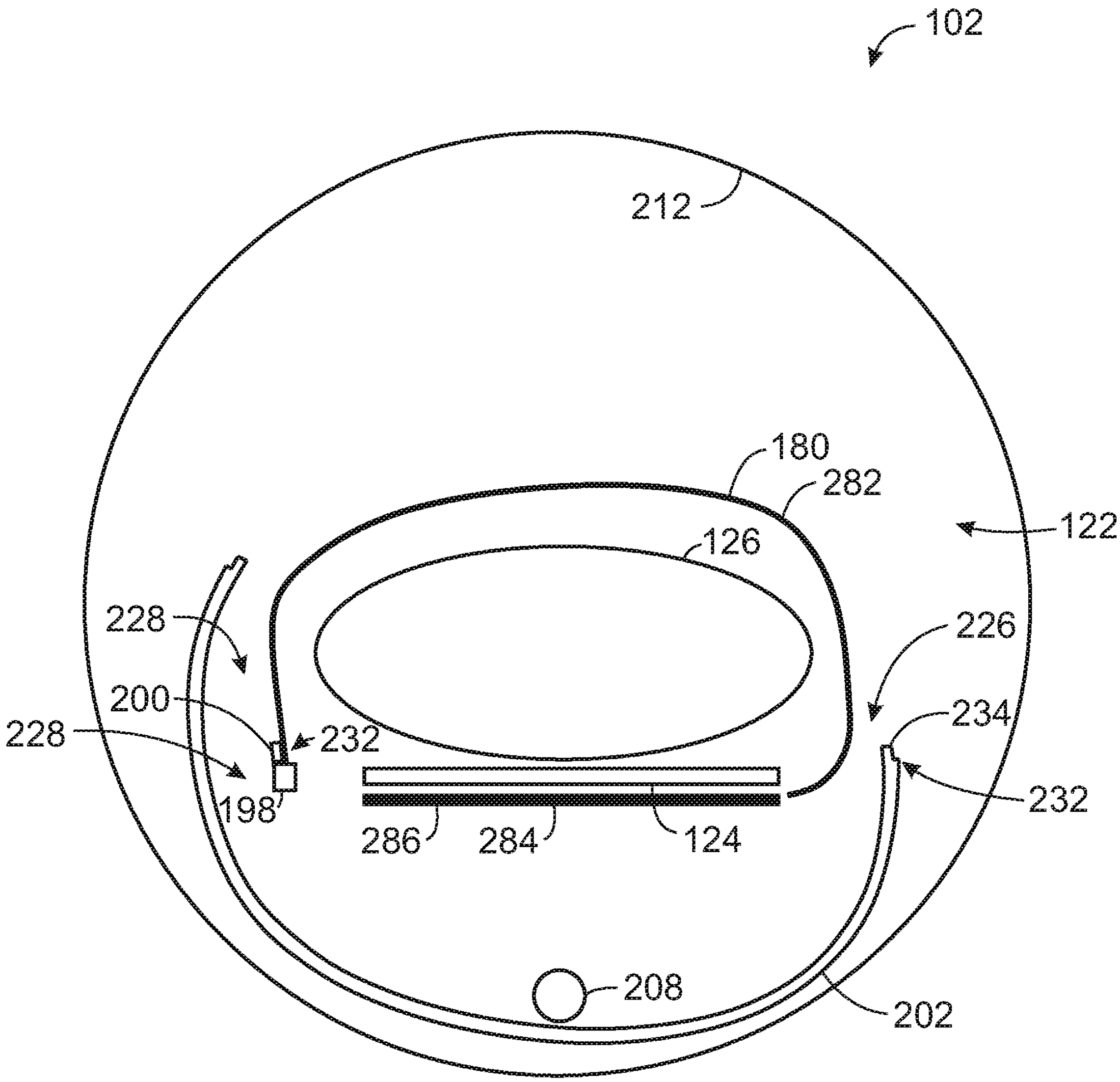
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FIG. 16

FLEXIBLE IN BORE RECEIVING COIL ARRAY FOR A MAGNETIC RESONANCE IMAGING SYSTEM

BACKGROUND

The subject matter disclosed herein relates to medical imaging and, more particularly, to a flexible in bore receiving coil array for a magnetic resonance imaging (MRI) system.

Non-invasive imaging technologies allow images of the internal structures or features of a patient/object to be obtained without performing an invasive procedure on the patient/object. In particular, such non-invasive imaging technologies rely on various physical principles (such as the differential transmission of X-rays through a target volume, the reflection of acoustic waves within the volume, the paramagnetic properties of different tissues and materials within the volume, the breakdown of targeted radionuclides within the body, and so forth) to acquire data and to construct images or otherwise represent the observed internal features of the patient/object.

During MRI, when a substance such as human tissue is subjected to a uniform magnetic field (polarizing field B_0), the individual magnetic moments of the spins in the tissue attempt to align with this polarizing field, but precess about it in random order at their characteristic Larmor frequency. If the substance, or tissue, is subjected to a magnetic field (excitation field B_1) which is in the x-y plane and which is near the Larmor frequency, the net aligned moment, or "longitudinal magnetization", M_z, may be rotated, or "tipped", into the x-y plane to produce a net transverse magnetic moment, M_t. A signal is emitted by the excited spins after the excitation signal B_1 is terminated and this signal may be received and processed to form an image.

When utilizing these signals to produce images, magnetic field gradients (G_x, G_y, and G_z) are employed. Typically, the region to be imaged is scanned by a sequence of measurement cycles in which these gradient fields vary according to the particular localization method being used. The resulting set of received nuclear magnetic resonance (NMR) signals are digitized and processed to reconstruct the image using one of many well-known reconstruction techniques.

To enhance signal-to-noise ratio in MRI systems receiving coil arrays are utilized. One of the problems with these receiving coil arrays is their specificity. In particular, receiving coil arrays are configured to image only specific parts of the human body. The typical receiving coil arrays may be unusable in certain situations. For example, size variations in the patient or particular medical conditions may make typical receiving coil arrays unusable. Even if a receiving coil array is sufficiently flexible to be wrapped around any part of the body, it still requires a technician to assist in correctly placing it. In addition, MRI systems usually need many more receiving channels than receiving elements in the field of view which makes cabling a complex problem.

SUMMARY

A summary of certain embodiments disclosed herein is set forth below. It should be understood that these aspects are presented merely to provide the reader with a brief summary of these certain embodiments and that these aspects are not intended to limit the scope of this disclosure. Indeed, this disclosure may encompass a variety of aspects that may not be set forth below.

In one embodiment, a magnetic resonance imaging (MRI) system is provided. The MRI system includes an MRI scanner having a bore. The MRI system also includes a table configured to move a subject to be imaged into and out of the bore of the MRI scanner. The MRI system further includes a flexible radio frequency (RF) receiving coil array integrated within the bore and electronically coupled directly to the MRI scanner, wherein the flexible RF receiving coil array remains in the bore regardless of a position of the table, and the flexible RF receiving coil array is located underneath the table when the table is located within the bore. The MRI system still further includes an automated mechanism configured to automatically move the flexible RF receiving coil array from underneath the table on a first side of the subject, to pull the flexible RF receiving coil array over the subject from the first side to a second side of the subject opposite the first side, and to fasten the flexible RF receiving coil array on the second side in preparation for a scan with the MRI scanner.

In another embodiment, a method for performing a magnetic resonance imaging (MRI) scan is provided. The method includes moving a subject into a bore of an MRI scanner via a table. The method also includes utilizing an automated mechanism to automatically move a flexible radio frequency (RF) receiving coil array from underneath the table on a first side of the subject, to pull the flexible RF receiving coil array over the subject from the first side to a second side of the subject opposite the first side, and to fasten the flexible RF receiving coil array on the second side in preparation for a scan with the MRI scanner, wherein the flexible RF receiving coil array is integrated within the bore and electronically coupled directly to the MRI scanner, the flexible RF receiving coil array remains in the bore regardless of a position of the table, and the flexible RF receiving coil array is located underneath the table when the table is located within the bore.

In a further embodiment, a magnetic resonance imaging (MRI) system is provided. The MRI system includes an MRI scanner having a bore. The MRI system also includes a table configured to move a subject to be imaged into and out of the bore of the MRI scanner. The MRI system further includes a flexible radio frequency (RF) receiving coil array integrated within the bore and electronically coupled directly to the MRI scanner, wherein the flexible RF receiving coil array is configured to be completely wrapped around any anatomical portion of the subject, the flexible RF receiving coil array remains in the bore regardless of a position of the table, and the flexible RF receiving coil array is located underneath the table when the table is located within the bore. The MRI system still further includes an automated mechanism configured to automatically move the flexible RF receiving coil array from underneath the table on a first side of the subject, to pull the flexible RF receiving coil array over the subject from the first side to a second side of the subject opposite the first side, and to fasten the flexible RF receiving coil array on the second side in preparation for a scan with the MRI scanner. The flexible RF receiving coil array includes a plurality of channels, each channel of the plurality of channels is located within a field of view of the MRI scanner and is utilized during the scan, and the plurality of channels are arranged in a plurality of rows along a longitudinal length of the flexible RF receiving coil array.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, aspects, and advantages of the present subject matter will become better understood when the following detailed description is read with reference to the accompanying drawings in which like characters represent like parts throughout the drawings, wherein:

FIG. **1** illustrates an embodiment of a magnetic resonance imaging (MRI) system, in accordance with aspects of the present disclosure;

FIG. **2** illustrates a flexible RF receiving coil array and an automated deployment system for manipulating the flexible RF receiving coil array, in accordance with aspects of the present disclosure;

FIG. **3** illustrates a flexible RF receiving coil array prior to be disposed about a subject (e.g., in a stored position) via an automated deployment system, in accordance with aspects of the present disclosure;

FIG. **4** illustrates the flexible RF receiving coil array in FIG. **3** being deployed about the subject utilizing the automated deployment system, in accordance with aspect of the present disclosure;

FIG. **5** illustrates the flexible RF receiving coil array in FIG. **3** disposed and secured about the subject (e.g., in a deployed position), in accordance with aspects of the present disclosure;

FIG. **6** illustrates a perspective view of a flexible RF receiving coil array being deployed about the subject utilizing a curved arm, in accordance with aspects of the present disclosure;

FIG. **7** illustrates a perspective view of a flexible RF receiving coil array being deployed about the subject utilizing a curved arm (e.g., having external antenna on the flexible RF receiving coil array), in accordance with aspects of the present disclosure;

FIG. **8** illustrates a perspective view of a cradle having an antenna, in accordance with aspects of the present disclosure;

FIG. **9** illustrates a linear arrangement of channels of a flexible RF receiving coil array, in accordance with aspects of the present disclosure;

FIG. **10** illustrates a staggered arrangement of channels of a flexible RF receiving coil array, in accordance with aspects of the present disclosure;

FIGS. **11**A-**11**C illustrate different schematic views of a flexible RF receiving coil array disposed about a head of a subject, in accordance with aspects of the present disclosure;

FIGS. **12**A-**12**C illustrate different schematic views of a flexible RF receiving coil array disposed about a torso of a subject, in accordance with aspects of the present disclosure;

FIGS. **13**A-**13**C illustrate different schematic views of a flexible RF receiving coil array disposed about a pelvis of a subject, in accordance with aspects of the present disclosure;

FIGS. **14**A-**14**C illustrate different schematic views of a flexible RF receiving coil array disposed about legs of a subject, in accordance with aspects of the present disclosure;

FIG. **15** illustrates a flow chart of a method for performing an MRI scan, in accordance with aspects of the present disclosure; and

FIG. **16** illustrates a flexible RF receiving coil array (e.g., anterior array) disposed and secured about the subject (e.g., in a deployed position) with an RF receiving coil array (e.g., posterior array) disposed under a table, in accordance with aspects of the present disclosure.

DETAILED DESCRIPTION

One or more specific embodiments will be described below. In an effort to provide a concise description of these embodiments, not all features of an actual implementation are described in the specification. It should be appreciated that in the development of any such actual implementation, as in any engineering or design project, numerous implementation-specific decisions must be made to achieve the developers' specific goals, such as compliance with system-related and business-related constraints, which may vary from one implementation to another. Moreover, it should be appreciated that such a development effort might be complex and time consuming, but would nevertheless be a routine undertaking of design, fabrication, and manufacture for those of ordinary skill having the benefit of this disclosure.

When introducing elements of various embodiments of the present subject matter, the articles "a," "an," "the," and "said" are intended to mean that there are one or more of the elements. The terms "comprising," "including," and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements. Furthermore, any numerical examples in the following discussion are intended to be non-limiting, and thus additional numerical values, ranges, and percentages are within the scope of the disclosed embodiments.

While aspects of the following discussion are provided in the context of medical imaging, it should be appreciated that the disclosed techniques are not limited to such medical contexts. Indeed, the provision of examples and explanations in such a medical context is only to facilitate explanation by providing instances of real-world implementations and applications. However, the disclosed techniques may also be utilized in other contexts, such as image reconstruction for non-destructive inspection of manufactured parts or goods (i.e., quality control or quality review applications), and/or the non-invasive inspection of packages, boxes, luggage, and so forth (i.e., security or screening applications). In general, the disclosed techniques may be useful in any imaging or screening context or image processing or photography field where a set or type of acquired data undergoes a reconstruction process to generate an image or volume.

The present disclosure provides systems and methods for a flexible in bore receiving coil array for MRI system. In particular, a flexible radio frequency (RF) receiving coil array (e.g., body coil array) is integrated within (e.g., disposed within and permanently coupled to) a bore of an MRI scanner. The flexible RF receiving coil array is electronically coupled directly to the MRI scanner (via a single connection). The flexible RF receiving coil array remains in the bore regardless of the position of a table that moves a subject (e.g., patient or object) into and out of the bore. In particular, the flexible RF receiving coil array is not coupled to the table (regardless of the position of the table). The flexible RF receiving coil array is located underneath the table when the table is located within the bore. The flexible RF receiving coil array is configured to be wrapped around any anatomical portion (e.g., head, torso, pelvis, and legs) of the subject to be imaged. A longitudinal length of the flexible RF receiving coil array is at least equal to a circumference of a largest subject that can be scanned within the bore of the MRI scanner.

The flexible RF receiving coil array includes a plurality channels, where each channel is located within a field of view of the MRI scanner and is utilized during the scan. The plurality of channels is arranged in a plurality of rows (e.g., 2 or more rows) along a longitudinal length of the flexible RF receiving coil array. In certain embodiments, the plurality of rows is aligned along a field of view. In certain embodiments, the plurality of channels is staggered with respect to each other along the longitudinal length (or longitudinal axis) of the flexible RF receiving coil array.

An automated mechanism is configured to automatically move the flexible RF receiving coil array from underneath the table on a first side of the subject, to pull the flexible RF receiving coil array over the subject from the first side to a second side of the subject opposite the first side, and to fasten the flexible RF receiving coil array on the second side in preparation for a scan within the MRI scanner (e.g., similar to how a seatbelt is secured). The automated mechanism is configured, after the scan of the subject, to automatically uncoupled the flexible RF receiving coil array and to return the flexible RF receiving coil array to underneath the table. In certain embodiments, after the initial scan, the table (and the subject) may be moved relative to the bore to reposition the subject and the process for deploying and securing the flexible RF receiving coil array is repeated in preparation for a second scan (e.g., of a different portion of the anatomy of the subject). In certain embodiments, the automated mechanism includes a tension spring (e.g., pull spring) that upon release or unfastening of the flexible RF receiving coil array from the second side returns the flexible RF receiving coil array to underneath the table. In certain embodiments, the automated mechanism includes a curved arm coupled to a drive mechanism, wherein the curved arm is configured to couple to the flexible RF receiving coil array, and the drive mechanism is configured to rotate the curved arm to pull the flexible RF receiving coil array about the subject. In certain embodiments, a set of rollers to keep an excess portion of the flexible RF receiving coil array not disposed over the subject during the scan in a rolled or folded arrangement underneath the table.

The disclosed embodiments eliminate the need for any connectors or cables for use with RF receiving coils in the table utilized for an MRI scan. Thus, the table can be utilized purely as a mechanical support. The disclosed embodiments also eliminate the need for coil placement and adjustment by a medical technician. The disclosed embodiments further enable all existing channels to be in the field of view and to be utilized during a scan. The disclosed embodiments provide for a flexible RF receiving coil array that can be utilized for scanning all parts of the anatomy. This may increase or speed up workflow. This may also reduce costs associated with medial professional assistance. This may also reduce costs since a scanner does not need to be equipped with multiple types of RF receiving coils.

With the preceding in mind, FIG. **1** a magnetic resonance imaging (MRI) system **100** is illustrated schematically as including a scanner **102**, scanner control circuitry **104**, and system control circuitry **106**. According to the embodiments described herein, the MRI system **100** is generally configured to perform MR imaging.

System **100** additionally includes remote access and storage systems or devices such as picture archiving and communication systems (PACS) **108**, or other devices such as teleradiology equipment so that data acquired by the system **100** may be accessed on- or off-site. In this way, MR data may be acquired, followed by on- or off-site processing and evaluation. While the MRI system **100** may include any suitable scanner or detector, in the illustrated embodiment, the system **100** includes a full body scanner **102** having a housing **120** through which a bore **122** is formed. A table **124** is moveable into the bore **122** to permit a patient **126** (e.g., subject) to be positioned therein for imaging selected anatomy within the patient.

Scanner **102** includes a series of associated coils for producing controlled magnetic fields for exciting the gyromagnetic material within the anatomy of the patient being imaged. Specifically, a primary magnet coil **128** is provided for generating a primary magnetic field, B_0, which is generally aligned with the bore **122**. A series of gradient coils **130**, **132**, and **134** permit controlled magnetic gradient fields to be generated for positional encoding of certain gyromagnetic nuclei within the patient **126** during examination sequences. A radio frequency (RF) coil **136** (e.g., RF transmit coil) is configured to generate radio frequency pulses for exciting the certain gyromagnetic nuclei within the patient. In addition to the coils that may be local to the scanner **102**, the system **100** also includes a set of receiving coils or RF receiving coils **138** (e.g., an array of coils) configured for placement proximal (e.g., against) to the patient **126**. As an example, the receiving coils **138** can include cervical/thoracic/lumbar (CTL) coils, head coils, single-sided spine coils, and so forth. Generally, the receiving coils **138** are placed close to or on top of the patient **126** so as to receive the weak RF signals (weak relative to the transmitted pulses generated by the scanner coils) that are generated by certain gyromagnetic nuclei within the patient **126** as they return to their relaxed state.

The various coils of system **100** are controlled by external circuitry to generate the desired field and pulses, and to read emissions from the gyromagnetic material in a controlled manner. In the illustrated embodiment, a main power supply **140** provides power to the primary field coil **128** to generate the primary magnetic field, Bo. A power input (e.g., power from a utility or grid), a power distribution unit (PDU), a power supply (PS), and a driver circuit **150** may together provide power to pulse the gradient field coils **130**, **132**, and **134**. The driver circuit **150** may include amplification and control circuitry for supplying current to the coils as defined by digitized pulse sequences output by the scanner control circuitry **104**.

Another control circuit **152** is provided for regulating operation of the RF coil **136**. Circuit **152** includes a switching device for alternating between the active and inactive modes of operation, wherein the RF coil **136** transmits and does not transmit signals, respectively. Circuit **152** also includes amplification circuitry configured to generate the RF pulses. Similarly, the receiving coils **138** are connected to switch **154**, which is capable of switching the receiving coils **138** between receiving and non-receiving modes. Thus, the receiving coils **138** resonate with the RF signals produced by relaxing gyromagnetic nuclei from within the patient **126** while in the receiving mode, and they do not resonate with RF energy from the transmitting coils (i.e., coil **136**) so as to prevent undesirable operation while in the non-receiving mode. Additionally, a receiving circuit **156** is configured to receive the data detected by the receiving coils **138** and may include one or more multiplexing and/or amplification circuits.

The receiving coil **138** utilized is a flexible RF receiving coil array **180** that is integrated within the bore **122** of the MRI scanner **102**. The flexible RF receiving coil array **180** is electronically coupled directly to the MRI scanner **102** (via a single connection). The flexible RF receiving coil array **180** remains in the bore **122** regardless of the position of the table **124** that moves the patient **126** into and out of the bore **122**. In particular, the flexible RF receiving coil array **180** is not coupled to the table **124** (regardless of the position of the table **124**). As discussed herein, the flexible RF receiving coil array **180** is located underneath the table **124** (e.g., in a stored position) when the table **124** is located within the bore **122**. In certain embodiments, the flexible RF receiving coil array **180** is located above the table **124** in a stored position. The flexible RF receiving coil array **180** is configured to be wrapped around any anatomical portion (e.g., head, torso, pelvis, and legs) of the patient **126** to be imaged. A longitudinal length of the flexible RF receiving coil array **180** is at least equal to a circumference of a largest patient **126** that can be scanned within the bore **122** of the MRI scanner **102**.

It should be noted that while the scanner **102** and the control/amplification circuitry described above are illustrated as being coupled by a single line, many such lines may be present in an actual instantiation. For example, separate lines may be used for control, data communication, power transmission, and so on. Further, suitable hardware may be disposed along each type of line for the proper handling of the data and current/voltage. Indeed, various filters, digitizers, and processors may be disposed between the scanner and either or both of the scanner and system control circuitry **104**, **106**.

As illustrated, scanner control circuitry **104** includes an interface circuit **158**, which outputs signals for driving the gradient field coils and the RF coil and for receiving the data representative of the magnetic resonance signals produced in examination sequences. The interface circuit **158** is coupled to a control and analysis circuit **160**. The control and analysis circuit **160** executes the commands for driving the circuit **150** and circuit **152** based on defined protocols selected via system control circuit **106**.

Control and analysis circuit **160** also serves to receive the magnetic resonance signals and performs subsequent processing before transmitting the data to system control circuit **106**. Scanner control circuit **104** also includes one or more memory circuits **162**, which store configuration parameters, pulse sequence descriptions, examination results, and so forth, during operation.

Interface circuit **164** is coupled to the control and analysis circuit **160** for exchanging data between scanner control circuitry **104** and system control circuitry **106**. In certain embodiments, the control and analysis circuit **160**, while illustrated as a single unit, may include one or more hardware devices. The system control circuit **106** includes an interface circuit **166**, which receives data from the scanner control circuitry **104** and transmits data and commands back to the scanner control circuitry **104**. The control and analysis circuit **168** may include a CPU in a multi-purpose or application specific computer or workstation. Control and analysis circuit **168** is coupled to a memory circuit **170** to store programming code for operation of the MRI system **100** and to store the processed image data for later reconstruction, display and transmission. The programming code may execute one or more algorithms that, when executed by a processor, are configured to perform reconstruction of acquired data as described below. In certain embodiments, image reconstruction may occur on a separate computing device having processing circuitry and memory circuitry.

An additional interface circuit **172** may be provided for exchanging image data, configuration parameters, and so forth with external system components such as remote access and storage devices **108**. Finally, the system control and analysis circuit **168** may be communicatively coupled to various peripheral devices for facilitating operator interface and for producing hard copies of the reconstructed images. In the illustrated embodiment, these peripherals include a printer **174**, a monitor **176**, and user interface **178** including devices such as a keyboard, a mouse, a touchscreen (e.g., integrated with the monitor **176**), and so forth.

A further interface circuit **182** may be provided to couple to an automated deployment system **184**. The automated deployment system **184** is configured to automatically (without any assistance from an operator) deploy (from a stored position) and secure the flexible RF receiving coil array **180** integrated within the bore **122** about the patient **126** (in a deployed position) in preparation for a scan. In the deployed position, the flexible RF receiving coil array **180** is disposed about (e.g., wrapped about) the contours of the patient in a region to be imaged. The automated deployment system **184** is also configured to automatically return the flexible RF receiving coil array **180** to its stored position. The automated deployment system **184** may include an automated mechanism for the movement of the flexible RF receiving coil array **180** between a stored position and a deployed position. The control circuit **160** may provide control signals for the actuation of the automated deployment system **184**.

FIG. **2** illustrates the flexible RF receiving coil array **180** and the automated deployment system **184** for manipulating the flexible RF receiving coil array **180**. The flexible RF receiving coil array **180** includes an RF coil **185** having a plurality of channels **186** (e.g., elements or loops) disposed within a flexible enclosure **188**. Each channel **186** is located within a field of view and is utilized during the scan. The plurality of channels **186** is arranged in a plurality of rows (e.g., 2 or more rows) along a longitudinal length of the flexible RF receiving coil array **180**. In certain embodiments, the plurality of rows is aligned along the field of view. In certain embodiments, the plurality of channels **186** is staggered with respect to each other along a longitudinal length (or a longitudinal axis) of the flexible RF receiving coil array **180**. In certain embodiments, the flexible RF receiving coil array **180** is configured to wirelessly receive communication signals from the control circuitry of the MRI scanner and to wirelessly transmit scan data to the control circuitry of the MRI scanner. In certain embodiments, the flexible RF receiving coil array **180** includes an antenna **187** coupled to the RF coil **185** and configured to wirelessly receive and transmits signals. In certain embodiments, the antenna **187** may be disposed external to the flexible RF receiving coil array **180** (e.g., on an external surface of the flexible enclosure **188** or within a cradle of a table of the MRI scanner).

As noted above, the flexible RF receiving coil array **180** is integrated within (e.g., disposed within and permanently coupled to) the bore of the MRI scanner (e.g., MRI scanner **102** in FIG. **1**). The flexible RF receiving coil array **180** is electronically coupled directly to the MRI scanner via single electronic connection or connector **190**. The flexible RF receiving coil array **180** remains in the bore regardless of the position of a table that moves a subject (e.g., patient or object) into and out of the bore. In particular, the flexible RF receiving coil array **180** is not coupled to the table (regardless of the position of the table). The flexible RF receiving coil array **180** is located underneath the table when the table is located within the bore. The flexible RF receiving coil array **180** is configured to be wrapped around any anatomical portion (e.g., head, torso, pelvis, and legs) of the subject to be imaged. A longitudinal length of the flexible RF receiving coil array **180** is at least equal to a circumference of a largest subject that can be scanned within the bore of the MRI scanner.

In certain embodiments, the flexible RF receiving coil array **180** includes one or more fasteners **192** coupled to (or located along) a side **194** of the flexible enclosure **188**. The one or more fasteners **192** are configured to fasten the flexible RF receiving coil array **180** when deployed about (e.g., wrapped around) the subject. The one or more fasteners **192** may be made of MRI-compatible material. In certain embodiments, the one or more fasteners **192** may be latches or latch plates or hooks configured to couple to or be disposed in one or more corresponding receptacles **198** (e.g., buckles) of the automated deployment system **184**. The flexible RF receiving coil array **180** may also include one or more connectors **200** (e.g., hooks or receptacles) coupled to (or located along) the side **194** of the flexible enclosure **188** configured to interact with a curved arm **202** that attaches to and moves the flexible RF receiving coil array **180**. The one or more connectors **200** may be made of MRI-compatible material.

The automated deployment system **184** includes an automated mechanism **204** configured to automatically move the flexible RF receiving coil array **180** from underneath the table on a first side of the subject, to pull the flexible RF receiving coil array **180** over the subject from the first side to a second side of the subject opposite the first side, and to fasten the flexible RF receiving coil array **180** on the second side in preparation for a scan within the MRI scanner (e.g., similar to how a seatbelt is secured). The automated mechanism **204** is configured, after the scan of the subject, to automatically uncoupled the flexible RF receiving coil array and to return the flexible RF receiving coil array **180** to underneath the table. Although the automated deployment system **184** is described in terms of deploying the flexible RF receiving coil array **180** from underneath the table, in certain embodiments, the automated deployment system **184** may be configured for deploying the flexible RF receiving coil array **180** from a stored position located above the table in the bore.

In certain embodiments, the automated mechanism **204** includes one or more corresponding receptacles **198** (e.g., buckles) to receive the fasteners **192** of the flexible RF receiving coil array **180** to secure the flexible RF receiving coil array **180** to the second side when deployed over (e.g., wrapped around) the subject. In certain embodiments, the corresponding receptacles **198** may release the flexible RF receiving coil array **180** (e.g., in response to a control signal provide to an actuator of the receptacles **198**). In certain embodiments, the automated mechanism **204** includes a tension spring **206** (e.g., pull spring) that upon release or unfastening of the flexible RF receiving coil array **180** from the second side returns the flexible RF receiving coil array **180** to underneath the table. The tension spring **206** may also provide tension to keep flexible RF receiving coil array **180** secure (e.g., disposed along the contours) about the subject.

In certain embodiments, the automated mechanism **204** includes a curved arm **202** coupled to a drive mechanism **208** (e.g., driven by a motor) for rotating the curved arm **202** about an axis (e.g., parallel with a central axis of the bore). The curved arm **202** is configured to couple to the flexible RF receiving coil array **180**, and the drive mechanism **208** is configured to rotate the curved arm **202** to pull the flexible RF receiving coil array **180** about the subject. For example, an end of the curved arm **202** may include one or more protrusions or hooks that interface with the one or more corresponding connectors on the flexible RF receiving coil array **180**.

In certain embodiments, the automated mechanism **204** includes a set of rollers **210** configured to keep the flexible RF receiving coil array **180** in a rolled or folded arrangement in its stored position (e.g. beneath the table when the table is within the bore). The set of rollers **210** also are configured to keep an excess portion of the flexible RF receiving coil array **180** not disposed over the subject during the scan in the rolled or folded arrangement underneath the table.

FIG. **3** illustrates the flexible RF receiving coil array **180** prior to being disposed about the subject **126** (e.g., patient) via the automated deployment system **184**. As depicted, the subject **126** is disposed on the table **124** within the bore **122** of the MRI scanner **102** (as defined by an inner surface **212** of the MRI scanner **102**). The flexible RF receiving coil array **180** is maintained in a storage position located under the table **124** (e.g., adjacent a lower portion of the bore **122**). In particular, a set of rollers **210** (as part of the automated mechanism **204**) keeps the flexible RF receiving coil array **180** disposed underneath the table **124** in a rolled or folded arrangement. The flexible RF receiving coil array **180** can move back and forth along the set of rollers **210** when being deployed and returned as indicated by arrow **224**.

The automated mechanism **204** is configured to automatically move the flexible RF receiving coil array **180** from underneath the table **124** on a first side **226** of the subject **126**, to pull the flexible RF receiving coil array **180** over the subject **126** from the first side **226** to a second side **228** of the subject **126** opposite the first side **226**, and to fasten the flexible RF receiving coil array **180** on the second side **228** in preparation for a scan within the MRI scanner **102** (e.g., similar to how a seatbelt is secured). As depicted, the automated mechanism **204** includes the curved arm **202**. The curved arm **202** extends underneath the table **124** between the first side **226** and the second side **228**. A portion of the curved arm **202** is also located beneath the set of rollers **210** and the flexible RF receiving coil array **180**. The curved arm **202** is coupled to the drive mechanism **208** (e.g., driven by a rotor). The automated mechanism **204** includes one or more receptacles **198** located on the second side **228**. An end **230** (e.g., side) of the flexible RF receiving coil array **180** may include one or more fasteners **192** for coupling the end **230** to the corresponding one or more receptacles **198** when the flexible RF receiving coil array **180** is secured (and disposed about the subject **126**). The curved arm **202** is configured to couple to the flexible RF receiving coil array **180**, and the drive mechanism **208** is configured to rotate the curved arm **202** to pull the flexible RF receiving coil array **180** about the subject **126**. For example, an end **232** of the curved arm **202** may include one or more protrusions or hooks **234** that interface with the one or more corresponding connectors **200** (e.g., on the end **230** adjacent the one or more fasteners **192**) on the flexible RF receiving coil array **180**. A length (along the curve about the rotation axis) of the curved arm **202** is long enough to engage the flexible RF receiving coil on the first side **226** and to move it to the second side **228** about the subject **126**. In certain embodiments, a different mechanism than the curved arm **202** may be utilized to deploy the flexible RF receiving coil array **180**.

FIG. **4** illustrates the flexible RF receiving coil array **180** in FIG. **3** being deployed about the subject **126** utilizing the automated deployment system **184**. The drive mechanism **208** rotates the curved arm **202** (as indicated arrow **236**) so that the one or more protrusions or hooks **234** (see FIG. **3**) on the end **232** of the curved arm **202** engages the one or more corresponding connectors **200** on the end **230** of the flexible RF receiving coil array **180** to couple the curved arm **202** to the flexible RF receiving coil array **180**. This engagement enables the curved arm **202** to move the flexible RF receiving coil array **180** from a stored position to a deployed position (e.g., disposed about or wrapped around a portion of the subject **126**). Continued rotation of the curved arm **202** by the drive mechanism **208** moves the flexible RF receiving coil array **180** from the first side **226** toward the second side **228** about the subject **126**.

FIG. **5** illustrates the flexible RF receiving coil array **180** in FIG. **3** disposed and secured about the subject **126** (e.g., in a deployed position). The curved arm **202** continues rotating in the direction **236** (shown in FIG. **4**) until the one or more fasteners **192** (see FIG. **3**) on the end **230** of the flexible RF receiving coil array **180** are engaged with and secured by the one or more corresponding receptacles **198** on the second side **228**. Upon securing the end **230** of the flexible RF receiving coil array **180** to the second side **228**, the curved arm **202** reverses direction as indicated by arrow **238** until the one or more hooks or protrusion **234** on the end **232** of the curved arm **202** disengage from the one or more corresponding connectors on the end **230** of flexible RF receiving coil array **180**. The curved arm **202** (via the drive mechanism) rotates to the position seen in FIG. **3**. A longitudinal length of the flexible RF receiving coil array **180** is at least equal to a circumference of a largest subject **126** that can be scanned within the bore **122** of the MRI scanner **102**. As depicted in FIG. **5**, the set of rollers **210** keep an excess portion of the flexible RF receiving coil array **180** not disposed over the subject **126** during the scan in the rolled or folded arrangement underneath the table **124**.

As depicted in FIG. **5**, a tension spring **206** (e.g., pull spring) is coupled to an end **240** (opposite the end **232**) of the flexible RF receiving coil array **180**. The tension spring **206** provide tension to keep the flexible RF receiving coil array **180** secure (e.g., disposed along the contours) about the subject **126**. Upon release or unfastening of the flexible RF receiving coil array **180** from the second side **228**, the tension spring **206** facilitates (via a force it exerts) the return of the flexible RF receiving coil array **180** to underneath the table **124** (e.g., to the stored position).

It should be noted that instead of a clockwise orientation for deploying the flexible RF receiving coil array **180** and a counter-clockwise orientation for returning the flexible, RF receiving coil array **180** from the end view depicted in FIGS. **3-5**, the flexible RF receiving coil array **180** and the automated deployment system **184** may be configured to operate in the opposite manner in reference to the same end view.

FIG. **6** illustrates a perspective view of the flexible RF receiving coil array **180** being deployed about the subject **126** utilizing the curved arm **202**. As depicted, the subject **126** is disposed on a cradle **242** of the table **124**. Some components of the automated deployment system **184** (e.g., rollers, tension spring, etc.) are not shown. As depicted, the curved arm **202** is coupled to the drive mechanism **208**. As described above, the drive mechanism **208** is configured to rotate the curved arm **202** to pull the flexible RF receiving coil array **180** about the subject **126** (e.g., utilizing the features (hooks, protrusions, connectors, etc.) on the flexible RF receiving coil array **180** and the curved arm **202**.

As mentioned above, in certain embodiments, the flexible RF receiving coil array **180** includes an antenna (e.g., internally) coupled to the RF coil **185** and configured to wirelessly receive and transmits signals. In certain embodiments, the antenna **187** may be disposed external to the flexible RF receiving coil array **180**. FIG. **7** illustrates a perspective view of the flexible RF receiving coil array **180** being deployed about the subject **126** utilizing the curved arm **202** (e.g., having external antenna on the flexible RF receiving coil array **180**). The flexible RF receiving coil array **180** is as described in FIG. **6**. As depicted, an external antenna **244** is disposed on an outer surface of the flexible enclosure **188** of the flexible RF receiving coil array **180**. The external antenna **244** is configured to wirelessly receive (e.g., control signals) and transmit signals (e.g., having scan data) to circuitry of the MRI scanner.

In certain embodiments, the antenna may be separate from the flexible RF receiving coil array. FIG. **8** illustrates a perspective view of the cradle **242** having an antenna **246**. The antenna **246** is disposed internally with the cradle **242**. The cradle **242** may include a side connection that when the cradle **242** as part of the table is disposed within the bore of the MRI scanner couple to the flexible RF receiving coil array **180** to enable wireless receiving and transmitting of signals to circuitry of the MRI scanner.

FIG. **9** illustrates a linear arrangement of the channels **186** of the flexible RF receiving coil array **180**. The flexible RF receiving coil array **180** includes the RF coil **185** having the plurality of channels **186** (e.g., elements or loops) disposed within the flexible enclosure **188**. As depicted, the RF coil **185** has 16 channels **186**. In certain embodiments, the number of channels **186** may be different (e.g., 8, 32, 64 or any other number of channels **186**). The plurality of channels **186** is arranged in a plurality of rows **248** along a longitudinal length **250** of the flexible RF receiving coil array **180**. As depicted, the plurality of channels **186** is arranged in two rows **248** (rows **252** and **254**). In certain embodiments, the plurality of channels **186** may be arranged in more than two rows **248**. As depicted, the plurality of rows **248** is aligned along a field of view (FOV) **256**. Each channel **186** of the plurality of channels **186** is located within the FOV **256** and is utilized during a scan. In certain embodiments, the plurality of channels **186** is staggered with respect to each other along a longitudinal length (or a longitudinal axis) of the flexible RF receiving coil array **180**.

FIG. **10** illustrates a staggered arrangement of the channels **186** of the flexible RF receiving coil array **180**. The flexible RF receiving coil array **180** includes the RF coil **185** having the plurality of channels **186** (e.g., elements or loops) disposed within the flexible enclosure **188**. As depicted, the RF coil **185** has 16 channels **186**. In certain embodiments, the number of channels **186** may be different (e.g., 8, 32, 64 or any other number of channels **186**). The plurality of channels **186** is arranged in the plurality of rows **248** along the longitudinal length **250** of the flexible RF receiving coil array **180**. As depicted, the plurality of channels **186** is arranged in two rows **248** (rows **252** and **254**). In certain embodiments, the plurality of channels **186** may be arranged in more than two rows **248**. As depicted, the plurality of channels **186** is staggered with respect to each other along the longitudinal length **250** (or a longitudinal axis) of the flexible RF receiving coil array **180**. For example, the row **252** is staggered relative to the row **254**. Each channel **186** of the plurality of channels **186** is located within the FOV **256** and is utilized during a scan. Whether the channels **186** are in a linear arrangement or a staggered arrangement, the flexible RF receiving coil array **180**, the impact on signal-to-noise ratio for the flexible RF receiving coil array **180** is minimal compared to traditional RF receiving coil sets.

As noted above, the flexible RF receiving coil array **180** is configured to be utilized for scanning all parts of the anatomy of the subject **126** (e.g., patient). FIGS. **11A-11C** illustrate different schematic views of the flexible RF receiving coil array **180** disposed about a head **258** of the subject **126**. FIG. **11A** is a side view of the flexible RF receiving coil array **180** disposed about the head **258** of the subject **126**. FIG. **11B** is a top view of the flexible RF receiving coil array **180** disposed about the head **258** of the subject **126**. FIG. **11C** is an end view (e.g., from the end of the subject with the head **258**) of the flexible RF receiving coil array **180** disposed about the head **258** of the subject **126**. Although not shown in FIGS. **11A-11C**, the flexible RF receiving coil array **180** may be wrapped around a supporting dome on the top of the head **258**. As depicted, the flexible RF receiving coil array **180** is completely wrapped around the head **258**.

As depicted, each channel **186** of the flexible RF receiving coil array **180** is located within the FOV and is utilized during a scan.

FIGS. **12**A-**12**C illustrate different schematic views of the flexible RF receiving coil array **180** disposed about a torso **260** of the subject **126**. FIG. **12**A is a side view of the flexible RF receiving coil array **180** disposed about the torso **260** of the subject **126**. FIG. **12**B is a top view of the flexible RF receiving coil array **180** disposed about the torso **260** of the subject **126**. FIG. **12**C is an end view (e.g., from the end of the subject with the head) of the flexible RF receiving coil array **180** disposed about the torso **260** of the subject **126**. As depicted, the flexible RF receiving coil array **180** is completely wrapped around the torso **260**. As depicted, each channel **186** of the flexible RF receiving coil array **180** is located within the FOV and is utilized during a scan.

FIGS. **13**A-**13**C illustrate different schematic views of the flexible RF receiving coil array **180** disposed about a pelvis **262** of the subject **126**. FIG. **13**A is a side view of the flexible RF receiving coil array **180** disposed about the pelvis **262** of the subject **126**. FIG. **13**B is a top view of the flexible RF receiving coil array **180** disposed about the pelvis **262** of the subject **126**. FIG. **13**C is an end view (e.g., from the end of the subject with the head) of the flexible RF receiving coil array **180** disposed about the pelvis **262** of the subject **126**. As depicted, the flexible RF receiving coil array **180** is completely wrapped around the pelvis **262**. As depicted, each channel **186** of the flexible RF receiving coil array **180** is located within the FOV and is utilized during a scan.

FIGS. **14**A-**14**C illustrate different schematic views of the flexible RF receiving coil array **180** disposed about legs **264** of the subject **126**. FIG. **14**A is a side view of the flexible RF receiving coil array **180** disposed about the legs **264** of the subject **126**. FIG. **14**B is a top view of the flexible RF receiving coil array **180** disposed about the legs **264** of the subject **126**. FIG. **14**C is an end view (e.g., from the end of the subject with the legs **264**) of the flexible RF receiving coil array **180** disposed about the legs **264** of the subject **126**. As depicted, the flexible RF receiving coil array **180** is completely wrapped around the legs **264**. As depicted, each channel **186** of the flexible RF receiving coil array **180** is located within the FOV and is utilized during a scan.

FIG. **15** illustrates a flow chart of a method **266** for performing an MRI scan. One or more steps of the method **266** may be performed by components (e.g., control circuitry) of the magnetic resonance imaging system **100** in FIG. **1**. One or more of the steps of the method **266** may be performed simultaneously or in a different order from the order depicted in FIG. **15**.

The method **266** includes moving a subject into a bore of an MRI scanner (e.g., MRI scanner **102** in FIG. **1**) via a table (block **268**). The method **266** also includes utilizing an automated mechanism to automatically move a flexible radio frequency (RF) receiving coil array (e.g., flexible RF receiving coil array **180** in FIG. **2**) from underneath the table on a first side of the subject, to pull the flexible RF receiving coil array over the subject from the first side to a second side of the subject opposite the first side, and to fasten the flexible RF receiving coil array on the second side in preparation for a scan with the MRI scanner (block **270**). As described above, the flexible RF receiving coil array is integrated within the bore and electronically coupled directly to the MRI scanner, the flexible RF receiving coil array remains in the bore regardless of a position of the table, and the flexible RF receiving coil array is located underneath the table when the table is located within the bore. The method **266** further includes performing a scan (via the MRI scanner) of a portion (e.g., head, torso, pelvis, legs) of the anatomy of the subject that the flexible RF receiving coil array is disposed about (e.g., wrapped around) (block **272**).

The method **266** even further includes, after the scan of the subject, utilizing the automated mechanism to automatically uncouple the flexible RF receiving coil array and to return the flexible RF receiving coil array to underneath the table (block **274**). The method **266** still further includes, after return of the flexible RF receiving coil array to underneath the table, moving the table to readjust a position of the subject within the bore (block **276**). The method **266** yet further includes utilizing the automated mechanism to automatically move the flexible RF receiving coil array from underneath the table on the first side of the subject, to pull the flexible RF receiving coil array over the subject from the first side to the second side of the subject opposite the first side, and to fasten the flexible RF receiving coil array on the second side in preparation for an additional scan with the MRI scanner, wherein the additional scan is for a different portion of the anatomy of the subject (block **278**). The method **266** also includes performing the additional scan (via the MRI scanner) of a different portion (e.g., head, torso, pelvis, legs) of the anatomy of the subject (than scanned in the first scan) that the flexible RF receiving coil array is disposed about (e.g., wrapped around) (block **280**).

FIG. **16** illustrates the flexible RF receiving coil array **180** (e.g., anterior array **282**) disposed and secured about the subject **126** (e.g., in a deployed position) with an RF receiving coil array **284** (e.g., posterior array **286**) disposed under the table **124**. The flexible RF receiving coil array **180** is similarly disposed about the subject **126** utilizing the curved arm **202** as described above. However, instead of having a portion of the flexible RF receiving coil array **180** folded underneath the table **124** when deployed, the flexible RF receiving coil array **180** is utilized as the anterior array **282** while an RF receiving coil array **284** is utilized as a permanent posterior array **286**. The RF receiving coil array **284** is located in a position underneath the table **124** when the table is disposed within the bore **122**. Similar to the flexible RF receiving coil array **180**, the RF receiving coil array **284** remains in the bore **122** regardless of the position of the table **124** that moves the subject **126** (e.g., patient or object) into and out of the bore **122**. In particular, the flexible RF receiving coil array **284** is not coupled to the table (regardless of the position of the table **124**). The flexible RF receiving coil array **180** and the RF receiving coil array **284** are utilized together during a scan. This embodiment enables a more compact arrangement.

Technical effects of the disclosed subject matter include eliminating the need for any connectors or cables for use with RF receiving coils in the table utilized for an MRI scan. Thus, the table can be utilized purely as a mechanical support. Technical effects of the disclosed subject matter also include eliminating the need for coil placement and adjustment by a medical technician. Technical effects of the disclosed subject matter further include enabling all existing channels to be in the field of view and to be utilized during a scan. Technical effects of the disclosed subject matter even further include providing for a flexible RF receiving coil array that can be utilized for scanning all parts of the anatomy. This may increase or speed up workflow. This may also reduce costs associated with medial professional assistance. This may also reduce costs since a scanner does not need to be equipped with multiple types of RF receiving coils.

The techniques presented and claimed herein are referenced and applied to material objects and concrete examples of a practical nature that demonstrably improve the present technical field and, as such, are not abstract, intangible or purely theoretical. Further, if any claims appended to the end of this specification contain one or more elements designated as "means for [perform]ing [a function] . . . " or "step for [perform]ing [a function] . . . ", it is intended that such elements are to be interpreted under 35 U.S.C. 112(f). However, for any claims containing elements designated in any other manner, it is intended that such elements are not to be interpreted under 35 U.S.C. 112(f).

This written description uses examples to disclose the present subject matter, including the best mode, and also to enable any person skilled in the art to practice the subject matter, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the subject matter is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

The invention claimed is:

1. A magnetic resonance imaging (MRI) system, comprising:

an MRI scanner having a bore;

a table configured to move a subject to be imaged into and out of the bore of the MRI scanner;

a flexible radio frequency (RF) receiving coil array permanently coupled to and disposed within the bore and electronically coupled directly to the MRI scanner, wherein the flexible RF receiving coil array remains in the bore regardless of a position of the table, and the flexible RF receiving coil array within the bore is located underneath the table when the table is initially moved into the bore; and

an automated mechanism configured to automatically move the flexible RF receiving coil array from underneath the table on a first side of the subject, to pull the flexible RF receiving coil array over the subject from the first side to a second side of the subject opposite the first side, and to fasten the flexible RF receiving coil array on the second side in preparation for a scan with the MRI scanner, wherein the automated mechanism comprises a set of rollers located in the bore that is configured to keep the flexible RF receiving coil array in a rolled or folded arrangement in a stored position within the bore prior to being pulled over the subject.

2. The MRI imaging system of claim **1**, wherein the flexible RF receiving coil array is not coupled to the table regardless of the position of the table.

3. The MRI imaging system of claim **1**, wherein the automated mechanism is configured, after the scan of the subject, to automatically uncouple the flexible RF receiving coil array and to return the flexible RF receiving coil array to underneath the table.

4. The MRI imaging system of claim **3**, wherein the automated mechanism comprises a tension spring to return the flexible RF receiving coil array to underneath the table.

5. The MRI imaging system of claim **1**, wherein the automated mechanism comprises a curved arm coupled to a drive mechanism, wherein the curved arm is configured to couple to the flexible RF receiving coil array, and the drive mechanism is configured to rotate the curved arm to pull the flexible RF receiving coil array about the subject.

6. The MRI imaging system of claim **1**, wherein the set of rollers is configured to keep an excess portion of the flexible RF receiving coil array not disposed over the subject during the scan in the rolled or folded arrangement underneath the table.

7. The MRI imaging system of claim **1**, wherein the flexible RF receiving coil array comprises a plurality of channels, and each channel of the plurality of channels is located within a field of view of the MRI scanner and is utilized during the scan.

8. The MRI imaging system of claim **7**, wherein the plurality of channels is arranged in a plurality of rows along a longitudinal length of the flexible RF receiving coil array.

9. The MRI imaging system of claim **8**, wherein the plurality of rows is aligned in along the field of view.

10. The MRI imaging system of claim **8**, wherein the plurality of rows is staggered with respect to each other along the longitudinal length.

11. The MRI imaging system of claim **1**, wherein the flexible RF receiving coil array is configured to be completely wrapped around any anatomical portion of the subject.

12. The MRI imaging system of claim **1**, wherein a longitudinal length of the flexible RF receiving coil array is at least equal to a circumference of a largest subject that can be scanned within the bore of the MRI scanner.

13. A method for performing a magnetic resonance imaging (MRI) scan, comprising:

moving a subject into a bore of an MRI scanner via a table; and

utilizing an automated mechanism to automatically move a flexible radio frequency (RF) receiving coil array from underneath the table on a first side of the subject, to pull the flexible RF receiving coil array over the subject from the first side to a second side of the subject opposite the first side, and to fasten the flexible RF receiving coil array on the second side in preparation for a scan with the MRI scanner, wherein the flexible RF receiving coil array is permanently coupled to and disposed within the bore and electronically coupled directly to the MRI scanner, the flexible RF receiving coil array remains in the bore regardless of a position of the table, and the flexible RF receiving coil array within the bore is located underneath the table when the table is initially moved into the bore, and wherein the automated mechanism comprises a set of rollers located in the bore that is configured to keep the flexible RF receiving coil array in a rolled or folded arrangement in a stored position within the bore prior to being pulled over the subject.

14. The method of claim **13**, further comprising, after the scan of the subject, utilizing the automated mechanism to automatically uncouple the flexible RF receiving coil array and to return the flexible RF receiving coil array to underneath the table.

15. The method of claim **14**, further comprising, after return of the flexible RF receiving coil array to underneath the table:

moving the table to readjust a position of the subject within the bore; and

utilizing the automated mechanism to automatically move the flexible RF receiving coil array from underneath the table on the first side of the subject, to pull the flexible RF receiving coil array over the subject from the first side to the second side of the subject opposite the first side, and to fasten the flexible RF receiving coil array on the second side in preparation for an additional scan with the MRI scanner, wherein the additional scan is for a different portion of anatomy of the subject than scanned in the scan.

16. The method of claim **13**, wherein the flexible RF receiving coil array is not coupled to the table regardless of the position of the table.

17. The method of claim **13**, wherein the flexible RF receiving coil array comprises a plurality of channels, and each channel of the plurality of channels is located within a field of view of the MRI scanner and is utilized during the scan.

18. The method of claim **17**, wherein the plurality of channels is arranged in a plurality of rows along a longitudinal length of the flexible RF receiving coil array.

19. The method of claim **13**, wherein the automated mechanism comprises a curved arm coupled to a drive mechanism, wherein the curved arm is configured to couple to the flexible RF receiving coil array, and the drive mechanism is configured to rotate the curved arm to pull the flexible RF receiving coil array about the subject.

20. A magnetic resonance imaging (MRI) system, comprising:

an MRI scanner having a bore;

a table configured to move a subject to be imaged into and out of the bore of the MRI scanner;

a flexible radio frequency (RF) receiving coil array permanently coupled to and disposed within the bore and electronically coupled directly to the MRI scanner, wherein the flexible RF receiving coil array is configured to be completely wrapped around any anatomical portion of the subject, the flexible RF receiving coil array remains in the bore regardless of a position of the table, and the flexible RF receiving coil array within the bore is located underneath the table when the table is initially moved into the bore; and

an automated mechanism configured to automatically move the flexible RF receiving coil array from underneath the table on a first side of the subject, to pull the flexible RF receiving coil array over the subject from the first side to a second side of the subject opposite the first side, and to fasten the flexible RF receiving coil array on the second side in preparation for a scan with the MRI scanner, wherein the automated mechanism comprises a set of rollers located in the bore that is configured to keep the flexible RF receiving coil array in a rolled or folded arrangement in a stored position within the bore prior to being pulled over the subject; and

wherein the flexible RF receiving coil array comprises a plurality of channels, each channel of the plurality of channels is located within a field of view of the MRI scanner and is utilized during the scan, and the plurality of channels is arranged in a plurality of rows along a longitudinal length of the flexible RF receiving coil array.

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