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MANIFOLD ASSEMBLY FOR PNEUMATIC SYSTEM

Abstract

A support surface assembly includes a covering defining an interior. Bladders are disposed within the interior. The bladders are operable between a deployed state and a non-deployed state. A manifold assembly is disposed within the interior of the covering. The manifold assembly includes a manifold core defining an inlet and multiple outlets. An engagement surface of the manifold core defines an inlet-connecting aperture in fluid communication with the inlet and multiple outlet-connecting apertures each in fluid communication with one of the multiple outlets. A connector includes an inner side that abuts the engagement surface of the manifold core. The inner side defines a recessed region. The connector is configured to be rotated by a motor to fluidly couple the inlet-connecting aperture with at least one of the outlet-connecting apertures to adjust the respective bladders between the deployed state and the non-deployed state.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application is a divisional of U.S. patent application Ser. No. 17/851,184, filed on Jun. 28, 2022, entitled "MANIFOLD ASSEMBLY FOR PNEUMATIC SYSTEM," which claims priority to and the benefit under 35 U.S.C. § 119(e) of U.S. Provisional Application No. 63/216,591, filed on Jun. 30, 2021, entitled "MANIFOLD ASSEMBLY FOR PNEUMATIC SYSTEM," the disclosure of which is hereby incorporated herein by reference in its entirety.

FIELD OF THE DISCLOSURE
[0002] The present disclosure generally relates to a manifold assembly, and more particularly to a manifold assembly for a pneumatic system for a patient support apparatus.
SUMMARY OF THE DISCLOSURE
[0003] According to one aspect of the present disclosure, a patient support apparatus includes a frame having a supporting surface. A mattress is disposed on the supporting surface. The mattress defines an interior. Bladders are disposed within the interior of the mattress and a manifold assembly is disposed within the interior of the mattress. The manifold assembly is in fluid communication with the bladders. The manifold assembly includes a manifold core having an inlet and multiple outlets. Each bladder is in fluid communication with one of the outlets. A connector is coupled to the manifold core. The connector has an inner side defining a recessed region. The inner side abuts the manifold core. A motor is configured to rotate the connector relative to the manifold core to fluidly couple the inlet with at least one of the outlets via an airflow passage defined at least partially by the recessed region.
[0004] According to another aspect of the present disclosure, a mattress includes a covering, which defines an interior. Multiple bladders are disposed within the interior. A manifold assembly is disposed within the interior. The manifold assembly includes a manifold core having an inlet tube extending from a first side thereof and defining an inlet and the manifold core has outlet tubes extending from a second side thereof. Each outlet tube defines an outlet. Each of the multiple bladders is in fluid communication with one of the outlets. A connector is coupled to the manifold core. The connector is configured to rotate between multiple positions to adjust the fluid communication between the inlet and at least one of the outlets. A blower is disposed within the interior of the mattress and in fluid communication with the inlet of the manifold assembly.
[0005] According to another aspect of the present disclosure, a pneumatic system for a mattress includes bladders operable between a deployed state and a non-deployed state. A housing is configured to be disposed within an interior of said mattress. A manifold assembly is disposed within the housing and in fluid communication with the bladders. The manifold assembly includes a manifold core having an inlet and outlets. An engagement surface of the manifold core defines an inlet-connecting aperture in fluid communication with the inlet and defines outlet-connecting apertures each in fluid communication with one of the outlets. A connector is rotatably coupled to the manifold core. The connector is configured to rotate between multiple positions relative to the manifold core to fluidly couple the inlet-connecting aperture with at least one outlet-connecting

apertures.
[0006] These and other features, advantages, and objects of the present disclosure will be further understood and appreciated by those skilled in the art by reference to the following specification, claims, and appended drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0007] In the drawings:
[0008] FIG. **1** is a side perspective view of a patient support apparatus, according to the present disclosure;
[0009] FIG. **2** is a cross-sectional view of a pneumatic system within a mattress, according to the present disclosure;
[0010] FIG. **3** is a top perspective view of a pneumatic system for a mattress having bladders in fluid communication with a manifold assembly, according to the present disclosure;
[0011] FIG. **4** is a top perspective view of a housing of a pneumatic system with a manifold assembly and a blower therein with the housing coupled to a control box, according to the present disclosure;
[0012] FIG. **5** is a side perspective view of a housing with a manifold assembly and a blower therein, according to the present disclosure;
[0013] FIG. **6** is a side perspective view of a manifold assembly in fluid communication with a blower for a pneumatic system, according to the present disclosure;
[0014] FIG. **7** is a side perspective exploded view of a portion of a pneumatic system, according to the present disclosure;
[0015] FIG. **8** is a side perspective partial exploded view of a manifold assembly for a pneumatic system, according to the present disclosure;
[0016] FIG. **9** is a cross-sectional view of a manifold core with channels extending therethrough, according to the present disclosure;
[0017] FIG. **10** is a side elevational view of a manifold core with outlet tubes arranged along a single side thereof, according to the present disclosure;
[0018] FIG. **11** is a side perspective view of a manifold core of a manifold assembly, according to the present disclosure;
[0019] FIG. **12** is a side elevational view of a manifold assembly, according to the present disclosure;
[0020] FIG. **13** is a cross-sectional view of a manifold assembly with a driveshaft extending through a manifold core and a connector, according to the present disclosure;
[0021] FIG. **14** is a side perspective view of an inner side of a manifold connector defining a recessed region for providing an airflow path, according to the present disclosure;
[0022] FIG. **15** is a top plan view of an inner side of a manifold connector defining a recessed region for providing an airflow path and defining release apertures, according to the present disclosure;
[0023] FIG. **16** is a side elevational view of a manifold assembly with a connector in a block position, according to the present disclosure;
[0024] FIG. **17** is a side elevational view of the manifold assembly of FIG. **16** with a recessed region of the connector illustrated on an engagement surface of a manifold core, according to the present disclosure;
[0025] FIG. **18** is a side elevational view of a manifold assembly with a connector in a first connecting position fluidly coupling an inlet with one outlet, according to the present disclosure;
[0026] FIG. **19** is a side elevational view of the manifold assembly of FIG. **18** with a recessed

region of the connector illustrated on an engagement surface of a manifold core, according to the present disclosure;

[0027] FIG. **20** is a side elevational view of a manifold assembly with a connector in a second connecting position fluidly coupling an inlet with two outlets, according to the present disclosure;

[0028] FIG. **21** is a side elevational view of the manifold assembly of FIG. **20** with a recessed region of the connector illustrated on an engagement surface of a manifold core, according to the present disclosure;

[0029] FIG. **22** is a side elevational view of a manifold assembly with a connector in a third connecting position fluidly coupling an inlet with one outlet, according to the present disclosure;

[0030] FIG. **23** is a side elevational view of the manifold assembly of FIG. **22** with a recessed region of the connector illustrated on an engagement surface of a manifold core, according to the present disclosure;

[0031] FIG. **24** is a side elevational view of a manifold assembly with a connector in a second connecting position fluidly coupling an inlet with two outlets, according to the present disclosure;

[0032] FIG. **25** is a side elevational view of the manifold assembly of FIG. **24** with a recessed region of the connector illustrated on an engagement surface of a manifold core, according to the present disclosure;

[0033] FIG. **26** is a side elevational view of a manifold assembly with a recessed region of a connector illustrated on an engagement surface of a manifold core with the connector in a block position and release apertures in fluid communication with two outlets, according to the present disclosure;

[0034] FIG. **27** is a side elevational view of a manifold assembly with a connector in a first release position, according to the present disclosure;

[0035] FIG. **28** is a side elevational view of the manifold assembly of FIG. **27** with a recessed region and release aperture of the connector illustrated on an engagement surface of a manifold core, according to the present disclosure;

[0036] FIG. **29** is a side elevational view of a manifold assembly with a connector in a second release position, according to the present disclosure;

[0037] FIG. **30** is a side elevational view of the manifold assembly of FIG. **29** with a recessed region and release apertures of the connector illustrated on an engagement surface of a manifold core, according to the present disclosure;

[0038] FIG. **31** is a block diagram of a pneumatic system, according to the present disclosure;

[0039] FIG. **32** is illustrative of an application interface displaying information and an alert related to a pneumatic system, according to the present disclosure;

[0040] FIG. **33** is a flow diagram of a method of installing a pneumatic system within a mattress, according to the present disclosure; and

[0041] FIG. **34** is a flow diagram of a method of treating a patient with a pneumatic system, according to the present disclosure.

DETAILED DESCRIPTION

[0042] The present illustrated embodiments reside primarily in combinations of method steps and apparatus components related to a manifold assembly for a pneumatic system. Accordingly, the apparatus components and method steps have been represented, where appropriate, by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments of the present disclosure so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein. Further, like numerals in the description and drawings represent like elements.

[0043] For purposes of description herein, the terms “upper,” “lower,” “right,” “left,” “rear,” “front,” “vertical,” “horizontal,” and derivatives thereof, shall relate to the disclosure as oriented in FIG. **1**. Unless stated otherwise, the term “front” shall refer to a surface closest to an intended viewer, and the term “rear” shall refer to a surface furthest from the intended viewer. However, it is to be understood that the disclosure may assume various alternative orientations, except where expressly specified to the contrary. It is also to be understood that the specific structures and processes illustrated in the attached drawings, and described in the following specification are simply exemplary embodiments of the inventive concepts defined in the appended claims. Hence, specific dimensions and other physical characteristics relating to the embodiments disclosed herein are not to be considered as limiting, unless the claims expressly state otherwise.

[0044] The terms “including,” “comprises,” “comprising,” or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that comprises a list of elements does not include only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. An element preceded by “comprises a . . . ” does not, without more constraints, preclude the existence of additional identical elements in the process, method, article, or apparatus that comprises the element.

[0045] With reference to FIGS. **1-34**, reference numeral **10** generally designates a patient support apparatus **10** having a frame **12** with a supporting surface **14**. A mattress **16** is disposed on the supporting surface **14**. The mattress **16** defines an interior **18**. Bladders **20** are disposed within the interior **18** of the mattress **16**. A manifold assembly **22** is in fluid communication with the bladders **20**. The manifold assembly **22** includes a manifold core **24** having an inlet **26** and multiple outlets **28**, **30**, **32**, **34**. Each bladder **20** is in fluid communication with one of the outlets **28**, **30**, **32**, **34**. The connector **36** is coupled to the manifold core **24**. The connector **36** has an inner side **38** that defines a recessed region **40**. The inner side **38** is configured to abut the manifold core **24**. A motor **42** is configured to rotate the connector **36** relative to the manifold core **24** to fluidly couple the inlet **26** with at least one of the outlets **28**, **30**, **32**, **34** via an airflow passage **44** at least partially defined by the recessed region **40**.

[0046] Referring to FIG. **1**, the support apparatus **10** is configured as a medical bed for use in a medical facility that includes an upper frame **60** and a base frame **62**, which are collectively referred to herein as the frame **12**. The upper frame **60** is generally adjustable relative to the base frame **62** (e.g., height, tilt, etc.). Additionally, the upper frame **60** includes multiple segments **64**, **66**, **68** that are independently movable relative to each other. The independently movable segments **64**, **66**, **68** allow for various portions of the upper frame **60** to be adjusted, such as, for example, an elevated head region or an elevated foot region. The segments **64**, **66**, **68** collectively form the supporting surface **14** for supporting the mattress **16** thereon.

[0047] The support apparatus **10** includes a headboard **78** that is selectively coupled to a head end of the support apparatus **10** and a footboard **80** that is selectively coupled to a foot end of the support apparatus **10**. Each of the headboard **78** and the footboard **80** may be fixedly coupled to the frame **12**, or alternatively may be removed from the support apparatus **10** to provide increased access to the patient. The support apparatus **10** include multiple base region siderails **82**, **84** and multiple head region siderails **86**, **88**. Each of the siderails **82**, **84**, **86**, **88** are operable between raised and lowered states to selectively allow access to the patient and ingress and egress from the support apparatus **10**.

[0048] In various examples, a connected user device **90** is coupled to at least one of the siderails **88** or disposed elsewhere on the support apparatus **10**. The connected user device **90** may include buttons or other selectable features that allow a caregiver or a patient to adjust aspects of the support apparatus **10** or the mattress **16**. While the support apparatus **10** is illustrated as the medical bed, the support apparatus **10** may be the medical bed, a stretcher, an examination table, an operating or surgical table, a recliner, etc. without departing from the teachings herein.

[0049] Referring to FIG. **2**, a support surface assembly **100** is disposed on the supporting surface **14** of the support apparatus **10**. In the illustrated configuration, the support surface assembly **100** is illustrated as the mattress **16**. However, the support surface assembly **100** may be the mattress **16**, a mattress pad, a coverlet, or other features for supporting a patient thereon.

[0050] The support surface assembly **100**, including the illustrated mattress **16**, generally includes a covering **102** or outer surface that defines the interior **18**. The covering **102** may be removable from the remainder of the support surface assembly **100** to clean or change the covering **102**. The covering **102** may include an upper covering portion **104** that couples to a base covering portion **106** to enclose the interior **18**. The upper and base covering portions **104**, **106** may be selectively coupled together to allow the caregiver to access the interior **18** of the support surface assembly **100**. Access to the interior **18** may be advantageous for inserting or adjusting the manifold assembly **22** described herein.

[0051] Referring still to FIG. **2**, as well as to FIG. **3**, a pneumatic system **110** is disposed within the interior **18** defined by the covering **102**. The pneumatic system **110** may be utilized for certain therapies and protocols, such as rotation (e.g., turn assist), pulmonary therapy (e.g., continuous lateral rotation therapy), and lateral pressure redistribution. The pneumatic system **110** generally includes the bladders **20**, the manifold assembly **22**, and a blower **112**. The bladders **20** are each selectively and independently operable between a deployed state and a non-deployed state. Fluid is directed from the blower **112**, through the manifold assembly **22**, and to the bladders **20** to adjust the bladders **20** to the deployed state. Fluid may also be directed from the bladders **20** and through at least one of the manifold assembly **22** and the blower **112** to adjust the bladders **20** to the non-deployed state. In various aspects, the deployed state is an inflated condition and the non-deployed state is a deflated condition. The bladders **20** are utilized to provide the various therapies and to support the patient as described further herein.

[0052] Referring still to FIG. **3**, in the illustrated configuration, the mattress **16** includes four bladders **114**, **116**, **118**, **120**, which are collectively referred to herein as the bladders **20**. The bladders **20** are generally arranged in a square or rectangular configuration. The bladders **20** are arranged in two pairs **122**, **124**, with each pair **122**, **124** having one bladder **114**, **118** under a back region of the patient and one bladder **116**, **120** under the sacral region of the patient. The first pair **122** of the bladders **114**, **116** and the second pair **124** of the bladders **118**, **120** are on opposing sides of a central longitudinal axis **126** of the mattress **16**. The bladders **114**, **116**, **118**, **120** in each pair **122**, **124** are aligned in a longitudinal direction. The bladders **114**, **116** in the first pair **122** are also laterally aligned with the bladders **118**, **120** in the second pair **124**. The configuration is advantageous for providing even distribution of pressure from the bladders **20** on both sides of the patient.

[0053] The bladders **20** are adjusted by the blower **112**, which includes an electrical connector **128** for receiving power and control signals from a control box **130**. The control box **130** is disposed within the interior **18** thereof. The control box **130** includes various electronics **132** that relate to functions of the mattress **16**, such as control of the blower **112**, the motor **42**, etc. The pneumatic system **110** includes a housing **140** for the blower **112** and the manifold assembly **22**, which may be selectively coupled to the control box **130**. In this way, the manifold assembly **22** may be integrated with or embedded in the mattress **16** similar to the control box **130**. The manifold assembly **22** may be relatively lightweight, which may be advantageous for providing a lighter mattress **16** for the caregiver to move.

[0054] The electronics **132** are electrically coupled to various features of the manifold assembly **22** and the pneumatic system **110**. For example, similar to the bower **112**, the motor **42** may be electrically coupled to the electronics **132** to receive power and activation signals. Other features, such as those that monitor information about the manifold assembly **22**, may also be coupled to the electronics **132** to receive power, as well as communicate sensed information as described herein.

[0055] Referring to FIGS. **4-7**, the housing **140** generally includes coupling features **142**, **144** that mate with corresponding coupling features **146**, **148** of the control box **130**. As best illustrated in FIG. **4**, the coupling features **142**, **144** defined by the housing **140** include a groove **142** and a rail **144**. The coupling features **146**, **148** of the control box **130** also include a groove **146** and a rail **148**. The groove **142** of the housing **140** is configured to slidably receive the rail **148** of the control box **130**, and the rail **144** of the housing **140** is configured to slidably engage the groove **146** of the control box **130**. The rails **144**, **148** are generally two opposing L-shaped members that are inserted into the respective grooves **142**, **146**, allowing motion in a first direction (e.g., illustrated as movement along a y-direction) and preventing separation in a second direction that is perpendicular to the first direction (e.g., illustrated as movement along an x-direction). The housing **140** may slidably couple with the control box **130** for convenient engagement and disengagement of the manifold assembly **22** with the mattress **16**.

[0056] The blower **112** and the manifold assembly **22** are disposed substantially within the housing **140**, providing a compact assembly within the mattress **16** for adjusting the bladders **20**. The housing **140** includes a selectively removable top **150** to access an interior **152** of the housing **140**. The blower **112** and the manifold assembly **22** operate to direct fluid into and out of the bladders **20**. Generally, the fluid is air but may be other fluid without departing from the teachings herein. The blower **112** generally includes an intake tube **160** that extends partially outside of the housing **140**. A side **162** of the housing **140** defines an aperture **164**, and the intake tube **160** of the housing **140** extends through the aperture **164**. The intake tube **160** allows the blower **112** to draw air from the interior **18** of the mattress **16** into the pneumatic system **110**, as well as expel air from the pneumatic system **110** into the interior **18** of the mattress **16**. The mattress **16** is generally not airtight to allow the inflow and outflow of air from the housing **140** without substantially affecting pressure within the mattress **16**.

[0057] The manifold core **24** includes an inlet tube **170** defining the inlet **26** on a first side **172** thereof. The blower **112** is in fluid communication with the inlet **26** via tubing **174**. The tubing **174** generally extends around the inlet tube **170**. The manifold core **24** also includes multiple outlet tubes **176**, **178**, **180**, **182** each defining one outlet **28**, **30**, **32**, **34**, respectively, on a second opposing side **184** of the manifold core **24**. In the illustrated configuration, the manifold assembly **22** includes four outlet tubes **176**, **178**, **180**, **182**, with each outlet tube **176**, **178**, **180**, **182** corresponding to and in fluid communication with one of the four bladders **114**, **116**, **118**, **120**. Generally, the inlet tube **170** and the outlet tubes **176**, **178**, **180**, **182** are arranged in a parallel configuration.

[0058] Referring still to FIGS. **4-7**, the manifold assembly **22** includes an outlet cap **190** that couples with the outlet tubes **176**, **178**, **180**, **182**. The outlet cap **190** is generally sized and shaped to fit about or around the four outlet tubes **176**, **178**, **180**, **182**. The outlet cap **190** extends partially into the housing **140** and partially out of the housing **140**. The outlet cap **190** also includes a rim **192**, which engages a side **194** of the housing **140** to retain the outlet cap **190** in the selected position relative to the housing **140**. Generally, as illustrated in FIG. **6**, the side **194** through which the outlet cap **190** extends is an adjacent side of the housing **140** relative to the side **162** that defines in the aperture **164** through which the intake tube **160** of the blower **112** extends.

[0059] The outlet cap **190** includes outlet engagement tubes **196** that are disposed outside of the housing **140**. Each outlet engagement tube **196** aligns with one of the outlet tubes **176**, **178**, **180**, **182** of the manifold core **24**. The outlet engagement tubes **196** form extensions of the outlet tubes **176**, **178**, **180**, **182** to engage tubing **198** outside of the housing **140**. The outlet engagement tubes **196** may extend generally parallel to the outlet tubes **176**, **178**, **180**, **182**, as illustrated in FIG. **5**, or may extend generally perpendicular to the outlet tubes **176**, **178**, **180**, **182**, as illustrated in FIG. **7**. The configuration of the outlet engagement tubes **196** may assist in coupling with the tubing **198**.

[0060] The manifold assembly **22** is in fluid communication with each of the bladders **20** via the tubing **198**. The tubing **198** extends through the interior **18** of the mattress **16**, between the bladders **20** and the outlet cap **190**. The tubing **198** directs fluid between the manifold assembly **22** and the bladders **20** based on the operation of the pneumatic system **110**. The tubing **198** fits about ends **200** of the outlet engagement tubes **196** to fluidly couple the manifold core **24** to the bladders **20**.

[0061] The manifold assembly **22**, including the engagements between the manifold assembly **22** and the various tubing **174**, **198** of the pneumatic system **110**, is an airtight assembly to prevent leakage of the fluid moving through the pneumatic system **110**. For example, in various locations,

the manifold assembly **22** includes a sealant **202** to provide this airtight engagement. The sealant **202** is generally grease disposed between two coupled components. The grease provides the airtight engagement while reducing the number of components included in the pneumatic system **110**.
[0062] Referring still to FIGS. **4-7**, the blower **112** is coupled to a support frame **210**, which may be fixedly coupled to a bottom **212** of the housing **140**. The support frame **210** retains the blower **112** in the selected position. The manifold core **24** is coupled to a support member **214**, which is coupled to the bottom **212** of the housing **140** spaced from the support frame **210** for the blower **112**. The support frame **210** and the support member **214** each retain the selected position of the supported components (i.e., the blower **112** and the manifold core **24**, respectively), including the spacing between the supported components. In this way, the spacing and arrangement between the blower **112** and the manifold core **24** are retained as the mattress **16** is moved, the patient moves on the mattress **16**, or as pressure through the pneumatic system **110** changes.
[0063] The housing **140** may include a filter **216** on one side **218** thereof. The filter **216** is coupled to the housing **140** via a retainer **220**. The filter **216** allows air to flow into and out of the housing **140**. It is contemplated that air removed from the bladders **20** may be released into the interior **152** of the housing **140**. This filter **216** may be advantageous for allowing air to flow from the housing **140** to reduce a buildup pressure around the manifold assembly **22**. The filter **216** also allows air to be drawn into the housing **140** to be used by the blower **112**.
[0064] Referring still to FIGS. **4-7**, in various aspects, additional components are included to manage the pressure change within the pneumatic system **110**. For example, the blower **112** is a radial blower **112**. The blower **112** is coupled to the tubing **174** via a pressure connector **222**. The pressure connector **222** maintains the connection between the blower **112** and the tubing **174**, particularly under pressure changes caused by activation of the blower **112**. The engagement between the pressure connector **222** and the blower **112** may include the sealant **202** to maintain the airtight connection therebetween.
[0065] The pneumatic system **110** may also include additional hosing **224** in the housing **140**. The hosing **224** may extend from the blower **112** and through the housing **140**. The hosing **224** may be utilized for guiding air from the blower **112** and out of the housing **140** to reduce the building up pressure within the housing **140**. The hosing **224** may be maintained in position via a holder **226** coupled to the housing **140**. The holder **226** may be advantageous for minimizing movement of the hosing **224** caused by pressure changes within the hosing **224** from activation of the blower **112**.
[0066] Each bladder **20** is in fluid communication with one of the outlets **28**, **30**, **32**, **34** of the manifold core **24**. Accordingly, fluid directed through one outlet **28**, **30**, **32**, **34** affects the corresponding bladder **20** without affecting the remaining bladders **20** of the pneumatic system **110**. The bladders **20** may be independently and selectively adjusted between the deployed and the non-deployed states. Generally, the deployed state is an inflated condition while the non-deployed state is a deflated condition. Air travels in a first direction, illustrated by arrow **230**, through the blower **112** and the manifold assembly **22** to inflate the bladders **20** and a second opposing direction, illustrated by arrow **232**, from the bladders **20** through at least one of the manifold assembly **22** and through the blower **112** to deflate the bladders **20**.
[0067] The inflated condition may be any level of inflation from a fully deflated condition. In such examples, the deflated condition is a fully deflated condition. Additionally or alternatively, the inflated condition and the deflated condition may be relative to a previous state of the bladders **20**. In such examples, the deflated condition may be a less inflated condition than a previous state of the bladders **20** (i.e., some amount of air released from the bladders **20**), and the inflated condition may be a more inflated condition (i.e., some amount of air directed into the bladders **20**).
[0068] Referring to FIG. **8**, the manifold assembly **22** includes the support member **214**, which has a base **240** and a support wall **242** extending from the base **240**. The support wall **242** is generally positioned in a central location on the base **240**, allowing components to be supported on each side of the support wall **242** over the base **240**. The manifold assembly **22** includes a motor assembly

244, which is positioned substantially on a first side **246** of the support wall **242**. The motor assembly **244** includes the motor **42** and a driveshaft **248** coupled to the motor **42**. In various examples, the motor **42** is configured as a stepper motor **42**, which may rotate the connector **36** to specific positions, as described further herein.

[0069] The motor **42** may pilot the function of the manifold assembly **22** by rotating the connector **36**. The motor **42** is configured to turn or rotate in two opposing directions **250**, **252** (i.e., a positive or clockwise direction **250** and a negative or counterclockwise direction **252**). The motor **42** is generally fixedly coupled to the support member **214** via fasteners **254**. The fasteners **254** may be screws, nails, bolts, or other coupling members. The driveshaft **248** extends through the support wall **242** to engage other components of the manifold assembly **22**, such as the connector **36**.

[0070] On a second opposing side **260** of the support wall **242**, the support wall **242** includes a rim **262**, which is generally an annular rim **262** defining a space for a biasing member **264**. The biasing member **264** is at least partially disposed within the space defined by the rim **262** and the support wall **242**. The biasing member **264** may be, for example, a compression spring. The compression spring is generally a conical or frusto-conical shape. The conical or frusto-conical shape allows for greater compression of the biasing member **264** to reduce the space utilized by the biasing member **264**. In such examples, the compression spring has a first diameter proximate to the support wall **242** and a second diameter proximate to the manifold core **24**, where the second diameter is larger than the first diameter.

[0071] In certain aspects, the compression spring may apply about two kilograms of force on the manifold core **24**. The manifold assembly **22** typically includes the single biasing member **264**. The biasing member **264** extends around the driveshaft **248** and engages a central portion **266** of the manifold core **24**. The biasing member **264** extends between the support wall **242** and the manifold core **24** to bias the manifold core **24** away from the support wall **242** and toward the connector **36**.

[0072] Referring still to FIG. **8**, as well as FIG. **9**, the manifold core **24** includes the inlet tube **170** on one side **172** and the outlet tubes **176**, **178**, **180**, **182** on the opposing side **184** thereof. The manifold core **24** has an engagement surface **280**, which faces away from the support wall **242** and is oriented toward the connector **36**. The manifold core **24** defines a driveshaft aperture **282** in the center thereof in which the driveshaft **248** extends to engage the connector **36**. Additionally, the engagement surface **280** defines an inlet-connecting aperture **284** on the side **172** adjacent to the inlet **26** and outlet-connecting aperture **286**, **288**, **290**, **292** on the side **184** adjacent to the outlets **28**, **30**, **32**, **34**. The inlet-connecting aperture **284** is in fluid communication with the inlet **26** such that an inlet channel **294** extends through the manifold core **24** from the inlet **26** to the inlet-connecting aperture **284**.

[0073] Each of the outlet-connecting apertures **286**, **288**, **290**, **292** is in fluid communication with one of the outlets **28**, **30**, **32**, **34**. Accordingly, in the illustrated example, there are four outlet channels **296**, **298**, **300**, **302** that extend through the manifold core **24** between the outlet-connecting apertures **286**, **288**, **290**, **292** and outlets **28**, **30**, **32**, **34**, respectively. Fluid traveling through the manifold core **24** to the bladders **20** travels through the inlet channel **294**, along the engagement surface **280**, and through one or more of the outlet channels **296**, **298**, **300**, **302**.

[0074] Referring still to FIG. **8**, as well as to FIG. **10**, the outlet tubes **176**, **178**, **180 182** are arranged along a single side **184** of the manifold core **24**. Generally, the first and third outlet tubes **176**, **180** are arranged as the outermost outlet tubes **176**, **180** and are aligned with one another. As illustrated, the first and third outlet tubes **176**, **180** are vertically aligned.

[0075] The second and fourth outlet tubes **178**, **182** are arranged as the innermost outlet tubes **178**, **182** and are aligned with one another. As illustrated, the second and fourth outlet tubes **178**, **182** are vertically aligned. Generally, the first outlet tube **176** is in fluid communication with the first bladder **114** aligned with the right back region of the patient, and the second outlet tube **178** is in fluid communication with the second bladder **116** aligned with the right sacral region of the patient. Similarly, the third outlet tube **180** is in fluid communication with the third bladder **118** aligned with the left back region of the patient, and the fourth outlet tube **182** is in fluid communication with the fourth bladder **120** aligned with the left sacral region of the patient.

[0076] Referring still to FIG. **8**, as well as to FIG. **11**, an inside **310** of the manifold core **24** that abuts the support member **214** is illustrated. The inlet tube **170** and the outlet tubes **176**, **178**, **180**, **182** are on opposing sides **172**, **184** of the manifold core **24**. In the illustrated example, the inlet tube **170** and the outlet tubes **176**, **178**, **180**, **182** extend partially into the inside **310** of the manifold core **24** but do not connect with one another inside the manifold core **24**. The inlet tube **170** ends on a first side of the driveshaft aperture **282** of the manifold core **24** without crossing a centerline **312** of the manifold core **24**. The outlet tubes **176**, **178**, **180**, **182** end on a second opposing side of the driveshaft aperture **282** without crossing the centerline **312** of the manifold core **24**. The connector **36** is utilized to fluidly couple the inlet tube **170** with the outlet tubes **176**, **178**, **180**, **182** as described further herein.

[0077] Referring still to FIG. **8**, as well as FIG. **12**, the manifold core **24** may be fixedly coupled to the support member **214**. In the illustrated configuration, two fasteners **314** are utilized to couple the manifold core **24** to the support wall **242**. This engagement with the fasteners **314** assists in retaining the manifold core **24**, as well as the connector **36**, in position as the connector **36** rotates relative to the manifold core **24**, as discussed further herein. Additionally or alternatively, the fasteners **314** may assist in locking the various components of the manifold assembly **22** into place relative to one another, which may increase the life cycle of the manifold assembly **22**.

[0078] The motor assembly **244**, the manifold core **24**, and the connector **36** are all substantially disposed over the base **240**, providing a compact assembly. The compact assembly reduces space utilized within the interior **18** of the mattress **16**, providing more space for other features, such as the bladders **20**. The outlet cap **190** extends beyond the support member **214** to extend through the side **194** of the housing **140**. The support member **214** is generally disposed adjacent to the side **194** of the housing **140**, with the rim **192** being slightly offset from an edge of the support member **214** to engage the housing **140**.

[0079] Referring still to FIG. **8**, the manifold assembly **22** includes an optical switch **320** coupled to the manifold core **24**. The manifold core **24** has an extension **322** disposed adjacent to the engagement surface **280** of the manifold core **24**, and the optical switch **320** may be coupled to the extension **322** via fasteners **324**. The optical switch **320** is configured to sense a position of the connector **36** and communicate the position information to the electronics **132** in the control box **130** (FIG. **4**).

[0080] As previously stated, the motor **42** may be an electric stepper motor **42** configured to adjust the connector **36** to certain predefined positions. While the stepper motor **42** may rotate the connector **36** to the predefined positions, the optical switch **320** may confirm or verify the position of the connector **36**. The optical switch **320** provides confirmation of the position of the connector **36** to maximize efficiency of the airflow through the manifold core **24**. Moreover, the optical switch **320** may provide a zero reference point for the connector **36**.

[0081] The connector **36** is rotatably coupled to the manifold core **24**. Generally, the engagement between the connector **36** and the manifold core **24** is an airtight engagement, which may be accomplished by using the sealant **202**. Additionally, a biasing force of the biasing member **264** biases the manifold core **24** toward the connector **36** to assist in providing and maintaining this airtight engagement. The connector **36** is configured to rotate about a rotational axis **330**, which extends substantially normal to a direction of fluid movement that extends through the manifold core **24**, indicated by the arrows **230**, **232**. The position of the connector **36** determines which of the outlet-connecting apertures **286**, **288**, **290**, **292** are in fluid communication with the inlet-connecting aperture **284** as described further herein. The connector **36** may have any practicable configuration for fluidly coupling the inlet **26** with at least one of the outlets **28**, **30**, **32**, **34**. The connector **36** may be a cover, a plate, a cap, a valve, a channeling valve, a disk, a valve disk, a valve, or any other feature that is configured to be adjusted by the motor assembly **244**.

[0082] Referring still to FIG. **8**, as well as FIG. **13**, the driveshaft **248** of the motor assembly **244** extends through the support wall **242** of the support member **214**, through the manifold core **24**, and through the connector **36**. The connector **36** has an outer side **332** that faces away from the manifold core **24**. The outer side **332** defines a receiving portion **334** in a center thereof adjacent to or extending over a driveshaft aperture **336**. The receiving portion **334** defines a groove **340**. The groove **340** is sized and shaped to receive an end of a retaining pin **342**. The retaining pin **342** extends through the driveshaft **248** and is positioned within the receiving portion **334** defined by the connector **36**. The retaining pin **342** then retains the connector **36** to the driveshaft **248**. Additionally, the retaining pin **342** is rotated by the driveshaft **248**, which, consequently, causes rotation of the connector **36** by engaging the receiving portion **334**.
[0083] The fasteners **314** coupling the manifold core **24** to the support member **214** assist in ensuring the retaining pin **342** remains in the receiving portion **334** of the connector **36**. When the manifold assembly **22** is installed in the mattress **16** or in use, force on the manifold assembly **22** may adjust the position of the retaining pin **342** if the fasteners **314** are not used. The fasteners **314** assist in retaining the components in position relative to one another to reduce the possibility of the retaining pin **342** being removed or shifting from the receiving portion **334**, which could affect the rotation of the connector **36** and, consequently, the function of the manifold assembly **22**.
[0084] Referring to FIGS. **14** and **15**, the connector **36** includes a flange **350** extending around a perimeter of the connector **36**. The flange **350** is offset from an inner surface **352** on the inner side **38** of the connector **36**. The flange **350** defines a notch **354**, which may be utilized by the optical switch **320** to determine the position of the connector **36**. Accordingly, the optical switch **320** may be configured to sense the position of the notch **354** to determine the position of the connector **36**.
[0085] The inner side **38** of the connector **36** defines the recessed region **40**, which is offset from a remainder of the inner surface **352** of the connector **36**. The recessed region **40** defines a specific shape allowing for the selective fluid coupling of the inlet-connecting aperture **284** and one or more of the outlet-connecting apertures **286**, **288**, **290**, **292**. The recessed region **40** defines two leg portions **356**, **358** extending from a connecting portion **360**. The leg portions **356**, **358** extend along opposing sides of the driveshaft aperture **336**. Each leg portion **356**, **358** includes a groove **362** generally aligned with the groove **362** of the other leg portion **356**, **358**. One side of the recessed region **40** is generally a mirror image across a central axis **364** of the connector **36**. The recessed region **40** defines a space that provides the airflow passage **44** for fluidly coupling the inlet **26** and the outlets **28**, **30**, **32**, **34** of the manifold core **24** as described further herein.
[0086] The outer side **332** of the connector **36** may have an irregular surface within an elevated portion **370**, which corresponds to the recessed region **40** on the opposing inner side **38**. The receiving portion **334** for the retaining pin **342** may be disposed on the elevated portion **370**. A peripheral surface **372** on the outer side **332** surrounding the elevated portion **370** may be recessed or offset from the elevated portion **370**. Supports **374** may extend outward from the elevated portion **370** to an edge **376** on the outer side **332** of the connector **36**, providing additional support for the connector **36**. It is also contemplated that the connector **36** may have a substantially flat outer surface such that the elevated portion **370** extends to the edge **376**.
[0087] As illustrated in FIG. **15**, in various aspects, the connector **36** defines release apertures **380**, **382**. The release apertures **380**, **382** are defined proximate to ends **384**, **386** of the leg portions **356**, **358** on an opposing side of the connector **36** relative to the connecting portion **360** of the recessed region **40**. The release apertures **380**, **382** extend through the connector **36** and are configured to provide a path for fluid to be released from the pneumatic system **110** as described further herein.
[0088] Referring to FIGS. **16-24**, the connector **36** is operable between a block position **400** and multiple connecting positions **402**, **404**, **406**, **408**. When the connector **36** is in the block position **400**, fluid or air is prevented or blocked from traveling through the manifold core **24** to the bladders **20**. Accordingly, in the block position **400**, the inlet **26** and the outlets **28**, **30**, **32**, **34** are not in fluid communication, and the bladders **20** are maintained in a current state. When the connector **36** is in

any of the various connecting positions **402**, **404**, **406**, **408**, the connector **36** allows air to flow through the manifold core **24** and at least one of the bladders **20** to be adjusted to the deployed state or the non-deployed state.

[0089] Referring still to FIGS. **16** and **17**, the connector **36** is illustrated in the block position **400**. The block position **400** may be an initial or default position that the connector **36** returns to at any given time. In the block position **400**, the connector **36** prevents airflow from traveling through the manifold core **24**. As best illustrated in FIG. **17**, the shape of the recessed region **40** is illustrated relative to the engagement surface **280** of the manifold core **24**. The connecting portion **360** of the recessed region **40** is disposed over the inlet-connecting aperture **284** allowing air from the inlet **26** to flow into the airflow passage **44**. The airflow passage **44** is defined and substantially enclosed by the engagement surface **280** and recessed region **40** on the inner side **38** of the connector **36**. However, based on the orientation of the connector **36**, the recessed region **40** and, consequently, the airflow passage **44**, are not disposed over any of the outlet-connecting apertures **286**, **288**, **290**, **292**. Therefore, air cannot flow through any of the outlet-connecting apertures **286**, **288**, **290**, **292**, thereby preventing fluid communication between the inlet **26** and any of the outlets **28**, **30**, **32**, **34**.

[0090] The block position **400** may be utilized to retain a current state of the bladders **20**, whether the bladders **20** are in the deployed state or the non-deployed state by preventing airflow through the manifold core **24**. Air is not directed into or out of the bladders **20** when the connector **36** is in the block position **400**. As the block position **400** is a default position, depending on a selected function of the pneumatic system **110**, the connector **36** may return to the block position **400** after being in any of the multiple connecting positions **402**, **404**, **406**, **408**. The block position **400** may be the zero reference point of the connector **36** sensed by the optical sensor.

[0091] Referring to FIGS. **18** and **19**, the connector **36** is illustrated in the first connecting position **402**, which fluidly couples the inlet **26** with the first outlet **28**. From the block position **400**, the connector **36** rotates in the first direction **250** in a range between about 80 degrees and about 85 degrees relative to the block position **400**. In certain aspects, the connector **36** may rotate about 82 degrees from the block position **400** to reach the first connecting position **402**. Generally, rotation in the first direction **250** is in the positive or clockwise direction **250**.

[0092] The rotation of the connector **36** changes the position of the airflow passage **44** relative to the engagement surface **280** of the manifold core **24**. As illustrated in FIG. **19**, the shape of the recessed region **40** in the first connecting position **402** is illustrated relative to the engagement surface **280** of the manifold core **24**. In the first connecting position **402**, a first side **416** of the connecting portion **360** of the recessed region **40** is disposed over the first outlet-connecting aperture **286**, which is in fluid communication with the first outlet **28**.

[0093] In this connecting position **402**, the second leg portion **358** is disposed over the inlet-connecting aperture **284**. The groove **362** of the second leg portion **358** may be advantageous for more fully aligning the recessed region **40** with the inlet-connecting aperture **284** to maximize airflow from the inlet-connecting aperture **284** into the airflow passage **44**. In this way, the configuration of the recessed region **40** minimizes or prevents blocking of the inlet-connecting aperture **284**. Air may travel through the inlet **26**, through the inlet-connecting aperture **284**, through the airflow passage **44** (i.e., along the second leg portion **358** and the connecting portion **360**), through the first outlet-connecting aperture **286**, and through the first outlet **28** to the first bladder **114**.

[0094] When the connector **36** is in the first connecting position **402**, the first bladder **114** may be adjusted to the deployed state, while the remaining bladders **116**, **118**, **120** are retained in their current state (e.g., deployed or non-deployed state). After the first bladder **114** is adjusted to the deployed state, the connector **36** may return to the block position **400**, which prevents airflow through the manifold core **24**. The prevention of airflow through the manifold core **24** allows the first bladder **114** to be maintained in the deployed state. The connector **36** may remain in the first connecting position **402** for a predefined period of time, until the bladder **114** reaches a predefined pressure, or a combination thereof. The predefined period of time or the predefined pressure may be sensed by an airflow sensor in the pneumatic system **110**, a pressure sensor in the pneumatic system **110**, etc.

[0095] The first bladder **114** may also be adjusted to the non-deployed state when the connector **36** is in the first connecting position **402**. The air may passively flow from the bladder **114**, through the manifold core **24**, and through the blower **112**. Alternatively, the blower **112** may be utilized to vacuum the air from the first bladder **114** to adjust the first bladder **114** to the non-deployed state. The air may be directed to or through the blower **112** and out of the housing **140**.

[0096] Referring to FIGS. **20** and **21**, the connector **36** is illustrated in the second connecting position **404**, which fluidly couples the inlet **26** with the first and second outlets **28**, **30**. The connector **36** is rotated in the first direction **250** in a range between about 120 degrees and about 130 degrees relative to the block position **400** (i.e., the zero reference point) to reach the second connecting position **404**. In certain aspects, the connector **36** rotates about 126 degrees relative to the block position **400** to reach the second connecting position **404**.

[0097] As illustrated in FIG. **21**, the shape of the recessed region **40** in the second connecting position **404** is illustrated relative to the engagement surface **280** of the manifold core **24**. In the second connecting position **404**, the connecting portion **360** of the recessed region **40** extends over both the first outlet-connecting aperture **286** and the second outlet-connecting aperture **288**. The first side **416** of the connecting portion **360** of the recessed region **40** is aligned with the second outlet-connecting aperture **288**, and a second side **418** of the connecting portion **360** is aligned with the first outlet-connecting aperture **286**. The end **386** of the second leg portion **358** is aligned with the inlet-connecting aperture **284**.

[0098] In this way, air may travel through the inlet **26**, through the inlet-connecting aperture **284**, through the airflow passage **44**, and through each of the first and second outlet-connecting apertures **286**, **288** to adjust the first and second bladders **114**, **116** to the deployed state. When the connector **36** is in the second connecting position **404**, the first and second bladders **114**, **116** may be adjusted to the deployed state, while the remaining bladders **118**, **120** are retained in their current state (e.g., deployed or non-deployed state). To maintain the first and second bladders **114**, **116** in the deployed state, the connector **36** may return to the block position **400** to retain the fluid in the first and second bladders **114**, **116**.

[0099] It is contemplated that the first and second bladders **114**, **116** may also be adjusted to the non-deployed state when the connector **36** is in the second connecting position **404**. The air may passively flow from the bladders **114**, **116**, through the manifold core **24**, and through the blower **112**, or the blower **112** may be utilized to vacuum the air from the first and second bladders **114**, **116** to adjust the first and second bladders **114**, **116** to the non-deployed state.

[0100] Referring again to FIGS. **22** and **23**, the connector **36** is illustrated in the third connecting position **406**, which fluidly couples the inlet **26** with the third outlet **32**. When in the third connecting position **406**, the connector **36** is rotated in the second direction **252** in a range between about 80 degrees and about 85 degrees relative to the block position **400**. The second direction **252** is generally the negative or counterclockwise direction **252**. As illustrated in FIG. **23**, the shape of the recessed region **40** in the third connecting position **406** is illustrated relative to the engagement surface **280** of the manifold core **24**. When in the third connecting position **406**, the second side **418** of the connecting portion **360** of the recessed region **40** is aligned with the third outlet-connecting aperture **290**, which is in fluid communication with the third outlet **32**. In this position, the first leg portion **356** is disposed over the inlet-connecting aperture **284**. The groove **362** may be advantageous for more fully aligning the recessed region **40** with the inlet-connecting aperture **284** to maximize airflow from the inlet-connecting aperture **284** into the airflow passage **44**. The configuration of the recessed region **40** minimizes or prevents blocking of the inlet-connecting aperture **284**.

[0101] Air may travel through the inlet **26**, through the inlet-connecting aperture **284**, through the airflow passage **44** (i.e., along the first leg portion **356** and the connecting portion **360**), through the third outlet-connecting aperture **290**, and through the third outlet **32** to the third bladder **118**. When the connector **36** is in the third connecting position **406**, the third bladder **118** may be adjusted to the deployed state, while the remaining bladders **114**, **116**, **120** are retained in their current state (e.g., deployed or non-deployed state). The connector **36** may return to the block position **400** to prevent air from being added or removed from the third bladder **118** and retain the fluid therein.

[0102] Additionally or alternatively, the third bladder **118** may also be adjusted to the non-deployed state when the connector **36** is in the third connecting position **406**. The blower **112** may be utilized to vacuum the air from the third bladder **118** to adjust the third bladder **118** to the non-deployed state. Alternatively, the air may passively flow from the bladder **118**, through the manifold core **24**, and through the blower **112**.

[0103] Referring to FIGS. **24** and **25**, the connector **36** is illustrated in the fourth connecting position **408**, which fluidly couples the inlet **26** with the third and fourth outlets **32**, **34**. The connector **36** is generally rotated in the second direction **252** in a range between about 120 degrees and about 130 degrees relative to the block position **400**. In certain aspects, the connector **36** rotates about 126 degrees relative to the block position **400** to reach the fourth connecting position **408**.

[0104] As illustrated in FIG. **25**, the shape of the recessed region **40** in the fourth connecting position **408** is illustrated relative to the engagement surface **280** of the manifold core **24**. In the fourth connecting position **408**, the connecting portion **360** of the recessed region **40** extends over both the third outlet-connecting aperture **290** and the fourth outlet-connecting aperture **292**. The first side **416** of the connecting portion **360** is aligned with the third outlet-connecting aperture **290**, and the second side **418** of the connecting portion **360** is aligned with the fourth outlet-connecting aperture **292**. The end **384** of the first leg portion **356** is aligned with the inlet-connecting aperture **284**.

[0105] In this configuration, air may travel through the inlet **26**, through the inlet-connecting aperture **284**, through the airflow passage **44**, and through the third and fourth outlet-connecting apertures **290**, **292** to adjust the third and fourth bladders **118**, **120** to the deployed state. When the connector **36** is in the fourth connecting position **408**, the third and fourth bladders **118**, **120** may be adjusted to the deployed state, while the remaining bladders **114**, **116** are retained in their current state (e.g., deployed or non-deployed state). To maintain the third and fourth bladders **118**, **120** in the deployed state, the connector **36** may return to the block position **400** to retain the fluid in the third and fourth bladders **118**, **120**.

[0106] It is contemplated that the third and fourth bladders **118**, **120** may also be adjusted to the non-deployed state when the connector **36** is in the fourth connecting position **408**. The air may passively flow from the third and fourth bladders **118**, **120**, through the manifold core **24**, and through the blower **112**. Alternatively, the blower **112** may be utilized to vacuum the air from the third and fourth bladders **118**, **120** to adjust the third and fourth bladders **118**, **120** to the non-deployed state.

[0107] Referring to FIGS. **16-25**, each of the connecting positions **402**, **404**, **406**, **408** may be utilized to adjust the respective bladders **20** between the deployed and non-deployed states. The connector **36** may return to the block position **400** to maintain the current state of each of the bladders **20**. Alternatively, the connector **36** may remain in the respective connecting position **402**, **404**, **406**, **408** while maintaining the corresponding bladders **20** in the select state. The deployed state may be a fully inflated condition or a partially inflated condition. Whether the fully inflated condition or partially inflated condition is used depends on various factors, for example, which protocol of the pneumatic system **110** is activated or an amount of pressure to be applied to the patient. Further, when in the inflated condition, the connector **36** may be adjusted to at least one of the connecting positions **402**, **404**, **406**, **408** and the bladders **20** may be adjusted to a less inflated condition or fully to a deflated condition. The air may be released from the bladders **20** actively, passively, or in a combination thereof. When in the deflated condition, it is contemplated that some air may remain in the bladders **20** without departing from the teachings herein. The air level in the bladders **20** in the deflated condition may not apply substantial pressure to the patient.

[0108] Referring to FIGS. **26-30**, with various configurations of the connector **36**, the connector **36** may also be operable between multiple release positions **430**, **432**. The connecting positions **402**, **404**, **406**, **408** may be utilized to adjust the bladders **20** to the deployed state and to maintain the bladders **20** in the current state. The release positions **430**, **432** may be utilized to release air from at least one bladder **20**. In this way, the release positions **430**, **432** may adjust at least one bladder **20** to the deflated condition or to a lesser inflated condition. Further, the release positions **430**, **432** may be advantageous for more fully releasing or venting air from the bladders **20**, for example, when a certain amount of air remains and the bladders **20** are in the non-deployed state. The venting may maximize the pressure difference between the various bladders **20**.

[0109] In the illustrated example, the connector **36** includes the two release apertures **380**, **382** as described with respect to FIG. **15**. The release apertures **380**, **382** may align with any of the outlet-connecting apertures **286**, **288**, **290**, **292** to release the air from the corresponding bladders **20**. For example, as illustrated in FIG. **26**, when the connector **36** is in the block position **400**, the release apertures **380**, **382** are aligned with the second and fourth outlet-connecting apertures **288**, **292**. Accordingly, when in the block position **400**, air may not be directed into any of the bladders **20**, but air may be released from the second and fourth bladders **116**, **120**.

[0110] The connector **36** with the release apertures **380**, **382** may also be operable between additional release positions **430**, **432**, as illustrated in FIGS. **27** and **29**. The release positions **430**, **432** illustrated in FIGS. **27** and **29** may not align with any other position (e.g., the block position **400** or the connecting positions **402**, **404**, **406**, **408**). To reach the first release position **430**, as illustrated in FIGS. **26** and **28**, the connector **36** rotates in the first direction **250** in a range between about 40 degrees and about 50 degrees from the block position **400**. In certain aspects, the connector **36** rotates about 45 degrees in the first direction **250** from the block position **400**.

[0111] As illustrated in FIGS. **27** and **28**, the outline of the recessed region **40** and the release apertures **380**, **382** in the first release positions **430** are illustrated relative to the engagement surface **280** of the manifold core **24**. The recessed region **40** partially aligns with the inlet-connecting aperture **284** and does not align with any of the outlet-connecting apertures **286**, **288**, **290**, **292**. Accordingly, airflow through the manifold core **24** in the first direction, as illustrated by arrow **230**, is prevented. The release apertures **380**, **382** are aligned with the third and fourth outlet-connecting apertures **290**, **292**, allowing air to release from the third and fourth bladders **118**, **120**. Further, the first and second bladders **114**, **116** remain in the current state (e.g., deployed or non-deployed).

[0112] As illustrated in FIGS. **29** and **30**, to reach the second release position **432**, the connector **36** rotates in the second direction **252** in a range between about 40 degrees and about 50 degrees from the block position **400**. In certain aspects, the connector **36** rotates about 45 degrees in the second direction **252** from the block position **400**. The release apertures **380**, **382** align with the first and second outlet-connecting apertures **286**, **288**, allowing air to be released from the first and second bladders **114**, **116**. When in the second release positions **432**, the third and fourth bladders **118**, **120** are maintained in the current state, as the airflow passage **44** does not fluidly couple the inlet-connecting aperture **284** with any of the outlet-connecting apertures **286**, **288**, **290**, **292**.

[0113] The amount of time the connector **36** is in the block position **400**, the first release position **430**, or the second release position **432**, determines how much fluid is released from the respective bladders **20**. For example, if the pressure in a selected bladder **20** is to be lowered but the bladder **20** is to remain at least partially inflated, the air may be released through the release apertures **380**, **382** for a shorter predefined period of time. If the selected bladder **20** is to be adjusted to the non-deployed state, the air may be released through the release apertures **380**, **382** for a longer period of time. The connector **36** may then be adjusted so the release apertures **380**, **382** do not align with any bladders **20** or the select bladders **20**.

[0114] Referring again to FIGS. **16-30**, the connector **36** with the release apertures **380**, **382** may provide for combination positions that allow selected bladders **20** to be adjusted to the deployed state while air is released from other bladders **20**. For example, when the connector **36** is in the first connecting position **402**, as illustrated in FIGS. **18** and **19**, the inlet **26** is fluidly coupled with the first outlet **28**. Additionally, one of the release apertures **380** is aligned with the third outlet-connecting aperture **290**. Accordingly, the first bladder **114** may be adjusted to the deployed state while the third bladder **118** has air released therefrom.
[0115] Additionally, when the connector **36** is in the third connecting position **406**, as illustrated in FIGS. **22** and **23**, one of the release apertures **382** is aligned with the first outlet-connecting aperture **286**. Additionally, the inlet **26** is in fluid communication with the third outlet **32**. The third bladder **118** may be adjusted to the deployed state while air is released from the first bladder **114**. It is contemplated that the connector **36** may include the release apertures **380**, **382** at other locations or in configurations. In such examples, different combinations of bladders **20** may have air released simultaneously or other combinations may be inflated and deflated simultaneously.
[0116] The motor **42** and the optical switch **320** may be utilized to adjust the position of the connector **36** to maximize airflow through the airflow passage **44**. The motor **42** may provide precision within about two to about five degrees of the angle of the various positions of the connector **36** set forth herein. In certain aspects, the motor **42** may provide precision of about +/−2 degrees of the angle for each respective position. The precision in the position of the connector **36** maximizes efficiency when adjusting the bladders **20** while minimizing air leakage. It is contemplated that the pneumatic system **110** may have a tolerance for operating at less precision without significant or any performance loss. For example, the manifold assembly **22** may support an angular position within a range of about five degrees to about ten degrees from the selected angle of the various positions. In certain aspects, the manifold assembly **22** may support the connector **36** in a selected position +/−6 degrees without significant performance loss.
[0117] Referring still to FIGS. **16-30**, the angular position of the various positions of the connector **36** may be calculated based on a variety of factors. For example, the angular positions may account for dispersion of the motor **42**, the configuration of the retaining pin **342**, the relationship between the retaining pin **342** and the connector **36**, and the rotation of the connector **36**. The angular positions may be adjusted based on the configuration of the connector **36** for maximizing airflow through the manifold assembly **22**. When adjusted, the positions may be monitored by the motor **42**, the optical switch **320**, or a combination thereof.
[0118] In various examples, the connector **36** may be adjusted at multiple different speeds. The connector **36** may rotate at a first speed until the connector **36** is at a predefined position relative to the selected connecting position **402**, **404**, **406**, **408** or release position **430**, **432**. The predefined position may be a predefined distance or angle from the selected position. For the remaining rotation between the predefined position and the selected position, the connector **36** may rotate at a second speed, which is generally slower than the first speed. This configuration may be advantageous for quickly adjusting the connector **36** toward the selected position and then slowing the connector **36** as the connector **36** approaches the selected position before the connector **36** stops rotating.
[0119] For example, the connector **36** may be rotated at the first speed to the predefined position, which may be about 5 degrees to about 15 degrees from the selected position, and then may rotate at the second speed. In certain aspects, the first speed may be a maximum speed with a speed in a range between about 60 rpm and 65 rpm and the second speed may be about 30% of the maximum speed (e.g., between about 20 rpm and about 25 rpm). The connector **36** may also move at two different speeds when adjusting to the block position **400** in a similar manner. Alternatively, the connector **36** may rotate at a single speed without departing from the teachings herein.
[0120] Generally, each bladder **20** may be adjusted from the fully deflated condition to the fully inflated condition in a range of about **30** seconds to about **40** seconds. Each bladder **20** may also be

adjusted from the fully inflated condition to the fully deflated position in a range between about **30** seconds and about **40** seconds. The deflation time may be accomplished when passively releasing air through the blower **112**, possibly releasing air via the release positions **430**, **432** of the connector **36**, or actively vacuuming air through the blower **112**. In certain aspects, each bladder **20** adjusts from the fully deflated condition to the fully inflated condition and from the fully inflated condition to the fully deflated condition in about 35 seconds.

[0121] Referring to FIG. **31**, the pneumatic system **110** includes a controller **440** communicatively coupled to the motor assembly **244**, the blower **112**, and the optical switch **320**. The controller **440** includes a processor **442**, a memory **444**, and other control circuitry. Instructions or routines **446** are stored within the memory **444** and executable by the processor **442**. At least one routine **446** relates to control of the rotation of the connector **36**. Additionally or alternatively, at least one routine **446** may relate to adjusting various parameters of the pneumatic system **110** as described further herein. The control circuitry may include communication circuitry **448** for bidirectional communication via wired or wireless communication protocols.

[0122] The caregiver may control the pneumatic system **110** through the connected user device **90** coupled to the support apparatus **10** (FIG. **1**). The controller **440** may receive user input from the connected user device **90** and activate at least one of the blower **112** and the motor assembly **244** to adjust the bladders **20**. Depending on the user input, at least one of the bladders **20** may be at least partially inflated or at least partially deflated. The user input may relate to activating a selected therapy. When a selected therapy is activated, the bladders **20** may be adjusted in a predefined pattern, resulting from continued adjustment of the connector **36** between the corresponding positions **402**, **404**, **406**, **408**, **430**, **432**.

[0123] The controller **440** may also monitor the position of the connector **36** from a signal received from the optical switch **320**. The connector **36** is generally adjusted to one of the connecting positions **402**, **404**, **406**, **408** or the release positions **430**, **432** via the motor assembly **244** in response to the user input or the selected therapy. Each of these connecting positions **402**, **404**, **406**, **408** and release positions **430**, **432** are a predefined position where the connector **36** is at a predefined angle or within a predefined range relative to the block position **400**. The motor **42** is configured to adjust the connector **36** to each of these predefined angles. The motor **42** is in communication with the controller **440** and may communicate when the connector **36** is at the predefined angle. The optical switch **320** may be used to confirm the position of the connector **36**. If the optical sensor senses that the connector **36** is not at the predefined angle, the optical switch **320** may communicate a signal to the controller **440**, which may alert the caregiver.

[0124] Additionally or alternatively, the optical switch **320** may communicate when the connector **36** is not fully aligned with the block position **400**. After the bladders **20** are adjusted based on the user input or the selected therapy, the connector **36** may return to the block position **400** to retain the current state of the bladders **20**. If the position communicated by the motor **42** does not align with the position sensed by the optical switch **320**, the controller **440** may alert the caregiver. The manifold assembly **22** may then be adjusted by the caregiver or a technician.

[0125] Referring still to FIG. **31**, the user input may relate to certain continuous or periodic therapy protocols for treatments for the patient. The connector **36** may be continuously or periodically adjusted between the connecting positions **402**, **404**, **406**, **408**, the release positions **430**, **432**, the block position **400**, or a combination thereof to provide the selected adjustment pattern of the bladders **20** based on the therapy protocol. The connector **36** may be adjusted to the block position **400** in between each adjustment to the connecting positions **402**, **404**, **406**, **408** or the release positions **430**, **432**, or alternatively, may be adjusted directly between connecting positions **402**, **404**, **406**, **408** or release positions **430**, **432** without stopping in the block position **400**.

[0126] Referring again to FIGS. **1-31**, the pneumatic system **110** may be utilized to provide various therapies to the patient on the support apparatus **10**. For example, the pneumatic system **110** may be used for continuous lateral rotation therapy. The bladders **20** may be inflated and deflated in a certain pattern to provide a gentle, side-to-side movement to the patient to aid in the prevention and treatment of pulmonary and other health complications related to immobility.

[0127] In the illustrated configuration, the first and third bladders **114**, **118** are arranged under the torso of the patient and operate to turn the torso along the longitudinal axis **126** in response to the inflation of one of the first and third bladders **114**, **118**. The second and fourth bladders **116**, **120** are arranged under a sacral region of the patient and operate to turn the legs of the patient along the longitudinal axis **126** in response to inflation of one of the second and fourth bladders **116**, **120**. The first and second bladders **114**, **116** are arranged under the right side of the patient while the third and fourth bladders **118**, **120** are arranged under the left side of the patient.

[0128] To rotate the patient to the right, the third and fourth bladders **118**, **120** (i.e., the second pair **124**) are inflated, while the first and second bladders **114**, **116** (i.e., the first pair **122**) may remain deflated or have additional air released or vented therefrom. To rotate the patient to the left, the first and second bladders **114**, **116** are inflated, while the third and fourth bladders **118**, **120** remain deflated or have additional air released or vented therefrom. In certain aspects, the first and second bladders **114**, **116** may be inflated to turn the patient to the left and then may be deflated to turn the patient to a center position. The third and fourth bladders **118**, **120** may then be inflated to turn the patient to the right. Accordingly, the bladders **20** may operate to adjust the patient between the center position, in which the patient is lying on his or her back, and lateral positions, in which the patient is lying on his or her right or left side. To provide this continuous lateral rotation therapy, the connector **36** may repeatedly be adjusted between the second connecting position **404** and the fourth connecting position **408**. The connector **36** may be adjusted directly from the second connecting position **404** to the fourth connecting position **408** and back.

[0129] Additionally or alternatively, the connector **36** may be adjusted to the block position **400** between the second connecting position **404** and the fourth connecting position **408**. In an additional non-limiting example, the connector **36** may be adjusted to the second connecting position **404** to inflate the first and second bladders **114**, **116** and then to the second release position **432** to deflate the first and second bladders **114**, **116**. In such examples, the connector **36** may then be adjusted to the fourth connecting position **408** to inflate the third and fourth bladders **118**, **120**, and then the first release positions **430** to deflate the third and fourth bladders **118**, **120**. The connector **36** may return to the block position **400** between the second connecting position **404** and the second release position **432**, as well as between the fourth connecting position **408** and the first release position **430**. In such configurations, the respective bladders **20** may be maintained in the inflated condition for a predefined period of time before being deflated. It is also contemplated that the connector **36** may adjust from the connecting position **404**, **408** to inflate the respective bladders **20**, to the block position **400**, and back to the respective connecting position **404**, **408** to deflate the bladders **20** passively or actively.

[0130] The controller **440** may control the pneumatic system **110** to vary a number of turns, a pause time in each turn, a duration of the continuous lateral rotation therapy, etc. to provide customized treatment to the patient. The amount of pressure provided by each bladder **20** may be set by the caregiver or may be in response to information about the patient, such as, for example, weight of the patient.

[0131] Referring still to FIGS. **1-31**, the pneumatic system **110** may also be utilized for providing turn assist for the caregiver. The controller **440** may include turn assist protocol, which is activated to assist the caregiver in turning the patient on the support apparatus **10** for linen changes, dressing changes, bedpan placement, back care, and other procedures or treatments. When the turn assist protocols are activated, some or all of the bladders **20** in the mattress **16** are adjusted. For example, when the patient is to be turned to his or her right side, the bladders **20** on the left side of the mattress **16** (i.e., the second pair **124** including the third and fourth bladders **118**, **120**) may inflate, consequently rotating the patient. In such examples, the bladders **20** on the right side may remain in a current state (e.g., neither inflate nor deflate) or may have air released to further contribute to the

rotation of the patient.
[0132] In the example of turning the patient to the right side, the connector **36** may be adjusted to the fourth connecting position **408** to allow the third and fourth bladders **118**, **120** to inflate. The connector **36** may then remain in the fourth connecting position **408** or return to the block position **400** to maintain the inflated condition of the third and fourth bladders **118**, **120**. Additionally or alternatively, the connector **36** may rotate to the second release position **432**, to release any air that may have been in the first and second bladders **114**, **116**. It is also contemplated that the third bladder **118** may be adjusted independently based on the turn assist protocol. In such examples, the caregiver may rotate an upper body of the patient and not the entire body of the patient. To adjust the patient to the left side, the connector **36** is adjusted to the second connecting position **404** to inflate the first and second bladders **114**, **116** or the first connecting position **402** to inflate the first bladder **114**.
[0133] In various examples, certain conditions of patient support apparatus **10** may be met before the turn assist protocol is initiated. For example, the siderails **82**, **84**, **86**, **88** in the direction the patient is to be turned may be raised before the turn assist protocol is initiated. In such configurations, an alert may be provided to the caregiver if the condition is not met prior to the attempted activation of the turn assist protocol.
[0134] Referring still to FIGS. **1-31**, in addition to the continuous lateral rotation therapy, other lateral pressure redistribution may be provided by the pneumatic system **110**. For example, the first bladder **114** or the third bladder **118** under the back region and the second bladder **116** or the fourth bladder **120** under the sacral region of the patient may be inflated or deflated independently to redistribute interface pressure from the mattress **16** on the patient. The lateral pressure redistribution helps the patient to relieve pressure on certain portions of the body to help reduce and prevent pressure ulcers. Pressure injuries, such as pressure ulcers and other skin breakdown, are localized damage to the skin and underlying soft tissue. Generally, the pressure injury is developed over a bony prominence. Pressure injuries develop as a result of intense pressure, prolonged pressure, pressure in combination with shear, or a combination thereof. The lateral pressure redistribution adjusts pressure points on the patient to reduce the formation of pressure ulcers.
[0135] Referring still to FIG. **31**, the various protocols may be initiated by the caregiver via the connected user device **90** on the support apparatus **10**. Additionally or alternatively, the controller **440** may be communicatively coupled with a remote user device **450** via a communication network **452**. The remote user device **450** may be, for example, a phone, a tablet, a laptop, a wearable device, other mobile communication devices, etc.
[0136] The communication network **452** may be part of a network of the medical facility. The network may include a combination of wired connections and wireless connections, which may include the wireless communication network **452**. The communication network **452** includes a variety of electronic devices, which may include a combination of various wired or wireless communication protocols. The communication network **452** may be implemented via one or more direct or indirect nonhierarchical communication protocols, including but not limited to, Bluetooth®, Bluetooth® low energy (BLE), Thread, Ultra-Wideband, Z-wave, ZigBee, etc.
[0137] Additionally, the communication network **452** may correspond to a centralized hierarchal communication network **452** where one or more of the devices communicate via a router (e.g., a communication routing controller). The communication network **452** may be implemented by a variety of communication protocols including, but not limited to, global system for mobile communication (GSM), general packet radio services, code division multiple access, enhanced data GSM environment, fourth generation (4G) wireless, fifth generation (5G) wireless, Wi-Fi, world interoperability for wired microwave access (WiMAX), local area network, Ethernet, etc. By flexibly implementing the communication network **452**, various devices and servers may communicate with one another directly via the wireless communication network **452** or a cellular data connection.

[0138] The controller **440** disclosed herein may include various types of control circuitry, digital or analog, and may each include the processor **442**, a microcontroller, an application specific circuit (ASIC), or other circuitry configured to perform the various input or output, control, analysis, or other functions described herein. The memory **444** described herein may be implemented in a variety of volatile and nonvolatile memory **444** formats. The routines **446** include operating instructions to enable various methods and functions described herein.
[0139] Referring to FIG. **32**, an exemplary application interface **454** of at least one of the connected user device **90** or the remote user device **450** is illustrated. The application interface **454** may be utilized to convey a variety of information to the caregiver, including information about the operation of the pneumatic system **110**. The application interface **454** may include therapy information **456** for indicating the current therapy being applied to the patient. If no therapy is currently being applied, the therapy information **456** may also include which therapy should be applied and when.
[0140] The application interface **454** may also show position information **458** of the connector **36**. Additionally or alternatively, the application interface **454** may also convey an alert message **460** to the caregiver about the position of the connector **36** of the manifold assembly **22**. When the position detected by the motor **42** does not align with the position sensed by the optical switch **320**, the application interface **454** may display, or otherwise convey, to the caregiver that the connector **36** may be misaligned and may need to be adjusted by the caregiver or a technician. The alert message **460** may indicate that the misalignment is within a predefined tolerance that does not substantially affect the performance of the manifold assembly **22**. In such examples, the alert message **460** may be a warning to monitor the operation of the manifold assembly **22**. Additionally or alternatively, the manifold assembly **22** may indicate that the misalignment is outside of the predefined tolerance and the efficiency of the manifold assembly **22** is being affected. The alert message **460** may be visual, audible, or haptic without departing from the teachings herein.
[0141] The application interface **454** may include adjustment features **462** for adjusting parameters of the pneumatic system **110**. Various parameters relating to the bladders **20** may be adjusted by the caregiver. For example, the pressure inside the bladders **20** or the pressure applied to the patient by the bladders **20** may be adjusted. Additionally or alternatively, the adjustment sequence (e.g., an inflation and deflation sequence), time to inflate or deflate, therapy, etc. may be adjusted by the caregiver. In additional non-limiting examples, the parameter may relate to the connector **36**. For example, the position of the connector **36** or the speed the connector **36** is rotating may be adjusted. These parameters are merely exemplary and are not considered limiting. It is contemplated that any of these parameters may be adjusted automatically by the controller **440**, manually by the caregiver, or a combination thereof.
[0142] Referring to FIG. **33**, as well as FIGS. **1-32**, a method **470** of installing the pneumatic system **110** in the support surface assembly **100**, such as the mattress **16**, includes step **472** of positioning the blower **112** and the manifold assembly **22** within the housing **140**. The support member **214** and the support frame **210** may be fixed to the housing **140**. Additionally, the blower **112** may be fixed to the support frame **210** and the manifold assembly **22** may be fixed to the support member **214**. Also in step **472**, the outlet cap **190** may be positioned to extend through the housing **140**, with the rim **192** engaging the side **194** of the housing **140**.
[0143] In step **474**, the blower **112** is fluidly coupled to the manifold assembly **22**. The tubing **174** is coupled to the blower **112** via the pressure connector **222** and the inlet tube **170** of the manifold core **24**. The blower **112** may also be coupled to the hosing **224**. Also in step **474**, the sealant **202** may be utilized to provide an airtight engagement between the tubing **174** and the blower **112** and the manifold core **24**. In step **476**, the top **150** of the housing **140** may be positioned over the manifold assembly **22** and the blower **112** to generally enclose the blower **112** and the manifold assembly **22** in the housing **140**.
[0144] In step **478**, the bladders **20** may be positioned within the interior **18** of the mattress **16**. The

pneumatic system **110** may be an additional component added to the mattress **16** during manufacturing or by the caregiver at a later time. The bladders **20** are generally arranged as described herein, with the first and third bladders **114**, **118** positioned under a back region of the patient and the second and fourth bladders **116**, **120** positioned under the sacral region of the patient. In certain aspects, the mattress **16** may include markers or other alignment features for positioning the bladders **20**.

[0145] In step **480**, the housing **140**, with the manifold assembly **22** and the blower **112**, is positioned within the interior **18** of the mattress **16** proximate to the bladders **20**. The housing **140** is generally positioned adjacent to the control box **130** that may generally already be positioned within the mattress **16**. The coupling features **142**, **144** of the housing **140** may slidably engage the coupling features **146**, **148** of the control box **130** to selectively secure the housing **140** to the control box **130**.

[0146] In step **482**, the bladders **20** are coupled to the manifold assembly **22**. The tubing **198** may be coupled to the bladders **20** and may be secured to the outlet cap **190** of the manifold assembly **22**. The sealant **202** may be used between at least the outlet cap **190** and the tubing **198** to provide an airtight engagement. It is contemplated that the manifold assembly **22** and/or the bladders **20** may be labeled to assist in aligning the bladders **20** with the respective outlets **28**, **30**, **32**, **34** of the manifold core **24**. Further, different patterns of adjusting the bladders **20** may be used by coupling the tubing **198** to different outlets **28**, **30**, **32**, **34** in step **482**.

[0147] In step **484**, the interior **18** of the mattress **16** is enclosed, and the pneumatic system **110**, including the housing **140** with the manifold assembly **22**, is enclosed within the interior **18** of the mattress **16**. The upper covering portion **104** and the base covering portion **106** may be coupled together by the caregiver, obscuring the pneumatic system **110** from view. Accordingly, the pneumatic system **110** may be fully installed or embedded in the interior **18** of the mattress **16**.

[0148] Referring to FIG. **34**, as well as FIGS. **1-33**, a method **490** of treating a patient with the support surface assembly **100** includes step **492** of providing the mattress **16** or other support surface assembly **100** on the support apparatus **10**. The support surface assembly **100** includes the pneumatic system **110**. In step **494**, a predefined protocol relating to the pneumatic system **110** is selected. Generally, the caregiver may select the predefined protocol via the connected user device **90** or the remote user device **450**. The predefined protocol may relate to various functions of the pneumatic system **110**, such as the turn assist function or a therapy. In step **494**, the selected protocol is communicated to the controller **440**.

[0149] In step **496**, the connector **36** of the manifold system is adjusted to one of the connecting positions **402**, **404**, **406**, **408**. The connector **36** adjusts from the block position **400** to the connecting position **402**, **404**, **406**, **408** that adjusts the selected bladders **20** to the deployed state. The selected bladders **20** may differ based on the protocol selected in step **494**. In various examples, the connector **36** may be adjusted at two different speeds. The connector **36** may initially rotate at the first speed and then the second speed as the connector **36** approaches the selected connecting position **402**, **404**, **406**, **408**.

[0150] In step **498**, the blower **112** of the pneumatic system **110** is activated. Generally, the blower **112** is activated when the connector **36** reaches the selected connecting position **402**, **404**, **406**, **408** from step **496**. The blower **112** may be activated during intervals or may continuously remain activated. When activated for intervals, the blower **112** may remain activated for a predefined period of time, until the selected bladders **20** reach a predefined pressure, or until the connector **36** is rotated again.

[0151] In step **500**, the connector **36** is adjusted to a subsequent position. The subsequent position may be the block position **400**, a different connecting position **402**, **404**, **406**, **408** than step **496**, and/or one of the release positions **430**, **432**. The previously selected bladders **20** may be maintained or deflated, other bladders **20** may be inflated, or a combination thereof. The subsequent position may also be used to inflate and deflate bladders **20** simultaneously.

[0152] In step **502**, the bladders **20** are selectively adjusted between the deployed state and the non-deployed state to provide the selected protocol. The bladders **20** may be adjusted to provide the turn assist function to assist the caregiver in turning the patient onto his or her side. Additionally or alternatively, at least one therapy may be provided by the pneumatic system **110**. The therapy may be, for example, lateral pressure redistribution or a pulmonary therapy, such as continuous lateral rotation therapy.
[0153] In step **504**, at least one parameter of the pneumatic system **110** may be adjusted automatically or by the caregiver. In various examples, the parameter may relate to the bladders **20**. For example, the pressure inside the bladders **20**, the pressure applied to the patient by the bladders **20**, the adjustment sequence (e.g., an inflation and deflation sequence), time to inflate or deflate, etc. may be adjusted by the caregiver. In additional non-limiting examples, the parameter may relate to the connector **36**. For example, the position of the connector **36** or the speed the connector **36** is rotating may be adjusted.
[0154] In step **506**, the alert message **460** may be provided to the caregiver via the application interface **454**. The alert message **460** may convey information about the operation of the pneumatic system **110**, as well as information about misalignment of the connector **36**. The caregiver may receive a visual, tactile, or haptic alert regarding the pneumatic system **110**. The caregiver may monitor the status of the pneumatic system **110** and any selected therapy via the application interface **454**. In certain aspects, the caregiver may utilize information from the alert message **460** to adjust the treatment of the patient, adjust the operation of the pneumatic system **110**, and/or contact a technician regarding the manifold assembly **22**.
[0155] In step **508**, the pneumatic system **110** may be deactivated. The pneumatic system **110** may automatically be deactivated when a therapy is completed, after a predefined period of time, or manually by the caregiver. Each of the bladders **20** may be returned to the deflated position upon deactivation of the pneumatic system **110**. Alternatively, each of the bladders **20** may be returned to a predefined inflated condition to provide support or comfort for the patient. It is also contemplated that the pneumatic system **110** may be utilized to increase the comfort of the patient on the support apparatus **10** as well as provide various protocols and therapies. Moreover, upon deactivation, the pneumatic system **110** may remain the mattress **16** or may be removed from the mattress **16**. It is understood that the steps of the methods **470**, **490** may be performed in any order, simultaneously, repeated, and/or omitted without departing from the teachings provided herein.
[0156] Use of the present device and system may provide for a variety of advantages. For example, the single manifold core **24** may be utilized to provide various inflation and deflation sequences of the bladders **20**. Also, the manifold assembly **22** may be a separate assembly from other pumps and systems that may be included in the mattress **16**. Additionally, the manifold connector **36** may be adjustable between the block position **400**, multiple connecting positions **402**, **404**, **406**, **408**, multiple release positions **430**, **432**, and combinations thereof. Additionally, the retaining pin **342** extending through the driveshaft **248** retains the connector **36** to the manifold core **24** while the biasing member **264** biases the core toward the connector **36**. Also, the optical switch **320** may be used to confirm or verify the position of the connector **36** in addition to the position determined by the motor **42**. Further, the manifold core **24** may be fastened to the support member **214**, such that force applied to the manifold assembly **22**, for example, when installing the manifold assembly **22**, may not adjust the retaining pin **342** from the position relative to the connector **36**.
[0157] Additionally, the manifold assembly **22** may be an airtight system by using the sealant **202** such as grease, which reduces a number of components of the manifold assembly **22**. Further, the manifold assembly **22** may include fewer components than conventional manifold systems, which provides more efficient manufacturing processes and can increase longevity of the manifold assembly **22**. Moreover, the conical or frusto-conical shape of the biasing member **264** may reduce the number of components in the manifold assembly **22**, while allowing the biasing member **264** to collapse or compress into a more compact configuration. Also, the pneumatic system **110** may

provide lateral pressure redistribution functions, turn assist functions, and rotation therapy functions. Moreover, the manifold assembly **22** is integrated into the mattress **16**, or other support surface assembly **100**, and is not an accessory added to the outside of the mattress **16** on the footboard **80**. Also, the manifold assembly **22** may also be a plug-in module for the mattress **16**. Additionally, the manifold assembly **22** may utilize less space than conventional manifold systems. Further, the manifold assembly **22** may be lighter than conventional manifold systems, which may be advantageous for providing a lighter mattress **16** for the caregiver to move. Additional benefits or advantages may be realized and/or achieved.

[0158] The device disclosed herein is further summarized in the following paragraphs and is further characterized by combinations of any and all of the various aspects described therein.

[0159] According to another aspect of the present disclosure, a patient support apparatus includes a frame having a supporting surface. A mattress is disposed on the supporting surface. The mattress defines an interior. Bladders are disposed within the interior of the mattress and a manifold assembly is disposed within the interior of the mattress. The manifold assembly is in fluid communication with the bladders. The manifold assembly includes a manifold core having an inlet and multiple outlets. Each bladder is in fluid communication with one of the outlets. A connector is coupled to the manifold core. The connector has an inner side defining a recessed region. The inner side abuts the manifold core. A motor is configured to rotate the connector relative to the manifold core to fluidly couple the inlet with at least one of the outlets via an airflow passage defined at least partially by the recessed region.

[0160] According to another aspect of the present disclosure, a manifold assembly includes a retaining pin disposed within a groove of a connector. A driveshaft is coupled to a motor and the retaining pin is coupled with the driveshaft to retain the connector to a manifold core.

[0161] According to another aspect of the present disclosure, a manifold assembly includes an optical switch disposed proximate to a manifold connector to sense a position of a connector.

[0162] According to another aspect of the present disclosure, each bladder is selectively operable between a deployed state and a non-deployed state based on a position of a connector.

[0163] According to another aspect of the present disclosure, a rotational axis of a connector is normal to a direction of fluid through a manifold core.

[0164] According to another aspect of the present disclosure, a manifold assembly includes a housing. A manifold core and a motor are disposed at least partially within an interior of the housing

[0165] According to another aspect of the present disclosure, a mattress includes a control box having electronics. A housing of a manifold assembly is selectively coupled to the control box within an interior of the mattress.

[0166] According to another aspect of the present disclosure, a manifold core defines outlet-connecting apertures in fluid communication with outlets via outlet channels, respectively. A connector defines release apertures. At least one of the release apertures is configured to align with at least one of the outlet-connecting apertures in a release position to release fluid from at least one bladder.

[0167] According to another aspect of the present disclosure, a blower is disposed within a housing and is fluidly coupled with an inlet of a manifold core.

[0168] According to another aspect of the present disclosure, a mattress includes a covering, which defines an interior. Multiple bladders are disposed within the interior. A manifold assembly is disposed within the interior. The manifold assembly includes a manifold core having an inlet tube extending from a first side thereof and defining an inlet and the manifold core has outlet tubes extending from a second side thereof. Each outlet tube defines an outlet. Each of the multiple bladders is in fluid communication with one of the outlets. A connector is coupled to the manifold core. The connector is configured to rotate between multiple positions to adjust the fluid communication between the inlet and at least one of the outlets. A blower is disposed within the interior of the mattress and in fluid communication with the inlet of the manifold assembly.

[0169] According to another aspect of the present disclosure, a first bladder of multiple bladders is adjusted between a deployed state and a non-deployed state when a connector is in a first connecting position which fluidly couples an inlet with an outlet.

[0170] According to another aspect of the present disclosure, a connector is configured to rotate in a range between 80 degrees and 85 degrees in a first direction from an initial position to be in a first connecting position.

[0171] According to another aspect of the present disclosure, a first bladder and a second bladder of multiple bladders are adjusted between a deployed state and a non-deployed state when a connector is in a second connecting position which fluidly couples an inlet with two outlets.

[0172] According to another aspect of the present disclosure, a connector is configured to rotate in a range between 120 degrees and 130 degrees in a first direction from an initial position to be in a second connecting position

[0173] According to another aspect of the present disclosure, a third bladder is adjusted between the deployed state and the non-deployed state when a connector is in a third connecting position which fluidly couples an inlet with an outlet.

[0174] According to another aspect of the present disclosure, a connector is configured to rotate in a range between 80 degrees and 85 degrees in a second direction relative to an initial position to be in a third connecting position.

[0175] According to another aspect of the present disclosure, a third bladder and a fourth bladder are adjusted between a deployed state and a non-deployed state when a connector is in a fourth connecting position which fluidly couples an inlet with two outlets.

[0176] According to another aspect of the present disclosure, a connector is configured to rotate in a range between 120 degrees and 130 degrees in a second direction from an initial position to be in a fourth connecting position.

[0177] According to another aspect of the present disclosure, a connector defines a recessed region. A manifold core defines outlet-connecting apertures in fluid communication with outlets. A position of the recessed region determines which of the outlet-connecting apertures are in fluid communication with an inlet and, consequently, which bladders are adjusted between a deployed state and a non-deployed state.

[0178] According to another aspect of the present disclosure, a connector defines a release aperture configured to allow fluid to be released from at least one bladder when the connector is in a release position.

[0179] According to another aspect, multiple positions include a first connecting position and a second connecting position. A connector is configured to rotate in a first direction from an initial position to reach the first connecting position and a second direction from the initial position to reach the second connecting position.

[0180] According to another aspect of the present disclosure, a connector is configured to block fluid communication between an inlet and each outlet when in an initial position.

[0181] According to another aspect of the present disclosure, a support surface assembly includes a covering defining an interior. Bladders are disposed within the interior. The bladders are operable between a deployed state and a non-deployed state. A manifold assembly is disposed within the interior of the covering. The manifold assembly includes a manifold core defining an inlet and multiple outlets. An engagement surface of the manifold core defines an inlet-connecting aperture in fluid communication with the inlet and multiple outlet-connecting apertures each in fluid communication with one of the multiple outlets. A connector includes an inner side that abuts the engagement surface of the manifold core. The inner side defines a recessed region. A motor is coupled to the connector. The connector is configured to be rotated by the motor to fluidly couple the inlet-connecting aperture with at least one of the outlet-connecting apertures to adjust the respective bladders between the deployed state and the non-deployed state.

[0182] According to another aspect of the present disclosure, a position of a recessed region determines which outlet-connecting apertures are in fluid communication with an inlet-connecting aperture and consequently which bladders are adjusted between a deployed state and a non-deployed state.
[0183] According to another aspect of the present disclosure, a recessed region has two leg portions extending from a connecting portion. The connecting portion is disposed over an inlet-connecting aperture when a connector is in a block position preventing fluid communication between the inlet-connecting aperture and any outlet-connecting apertures.
[0184] According to another aspect of the present disclosure, a connecting portion is adjusted over at least one outlet-connecting aperture. At least one leg portion is adjusted over an inlet-connecting aperture when a connector is adjusted to a connecting position.
[0185] According to another aspect of the present disclosure, a connector is configured to be rotated between multiple positions to selectively adjust at least one bladder between a deployed state and a non-deployed state.
[0186] According to another aspect of the present disclosure, multiple positions include a block position that prevents fluid communication, a connecting position that allows adjustment of at least one bladder between a deployed state and a non-deployed state, and a release position that releases air from at least one of the bladders.
[0187] According to another aspect of the present disclosure, a deployed state is an inflated condition and a non-deployed state is a deflated condition.
[0188] According to another aspect of the present disclosure, a connector defines release apertures.
[0189] According to another aspect of the present disclosure, two bladders are adjusted to a non-deployed state when a connector is rotated to a release position to align release apertures align with respective outlet-connecting apertures.
[0190] According to another aspect of the present disclosure, a connector is configured to rotate in a range between 40 degrees and 50 degrees from an initial position to be in a release position.
[0191] According to another aspect of the present disclosure, fluid travels through a manifold assembly in a first direction to adjust at least one bladder to a deployed state and in a second direction to adjust at least one of the bladders to a non-deployed state. Each of the first direction and the second direction are normal to a rotational axis of a connector.
[0192] According to another aspect of the present disclosure, a manifold core includes an inlet tube extending from a first side thereof defining the inlet and multiple outlet tubes extending from a second side thereof. Each of the outlet tubes defines one of the outlets.
[0193] According to another aspect of the present disclosure, an inlet tube and outlet tubes are arranged in a parallel configuration.
[0194] According to another aspect of the present disclosure, a support surface assembly includes a covering defining an interior. Bladders are disposed within the interior. A blower is in fluid communication with the bladders and disposed within the interior. A manifold assembly is disposed within the interior of the covering. The manifold assembly includes a manifold core defining an inlet and multiple outlets. Each outlet is in fluid communication with one of the bladders. A connector is rotatably coupled to the manifold core. Connecting positions of the connector provide selective fluid communication between the inlet and at least one of the outlets to adjust at least one of the bladders to a deployed state. The connector defines a release aperture configured to allow fluid to be released from at least one of the bladders when the connector is in a release position.
[0195] According to another aspect of the present disclosure, a manifold assembly includes a motor assembly including a motor and a driveshaft. The driveshaft extends through a manifold core to engage a connector.
[0196] According to another aspect of the present disclosure, a manifold assembly includes a retaining pin that extends through a driveshaft and is disposed within a groove defined by a connector.

[0197] According to another aspect of the present disclosure, a connector is configured to rotate in a first direction and a second direction from an initial position to reach at least one connecting position.
[0198] According to another aspect of the present disclosure, a first direction is a clockwise direction and a second direction is a counterclockwise direction.
[0199] According to another aspect of the present disclosure, an initial position is a block position that prevents fluid communication between an inlet and any outlet.
[0200] According to another aspect of the present disclosure, a manifold assembly includes an optical switch coupled to a manifold core to sense a position of a connector.
[0201] According to another aspect of the present disclosure, a manifold assembly includes a support member and a biasing member. The biasing member is coupled between the support member and a manifold core and biases the manifold core toward a connector.
[0202] According to another aspect of the present disclosure, a biasing member is a spring having first diameter proximate to a support member and a second diameter proximate to a manifold core. The second diameter is greater than the first diameter.
[0203] According to another aspect of the present disclosure, a manifold assembly includes a motor and a driveshaft. The driveshaft extends through a support member, a biasing member, a manifold core, and a connector.
[0204] According to another aspect of the present disclosure, a manifold core is fastened to a support member
[0205] According to another aspect of the present disclosure, a pneumatic system for a mattress includes bladders operable between a deployed state and a non-deployed state. A housing is configured to be disposed within an interior of said mattress. A manifold assembly is disposed within the housing and in fluid communication with the bladders. The manifold assembly includes a manifold core having an inlet and outlets. An engagement surface of the manifold core defines an inlet-connecting aperture in fluid communication with the inlet and defines outlet-connecting apertures each in fluid communication with one of the outlets. A connector is rotatably coupled to the manifold core. The connector is configured to rotate between multiple positions relative to the manifold core to fluidly couple the inlet-connecting aperture with at least one of the outlet-connecting apertures.
[0206] According to another aspect of the present disclosure, a blower is disposed within a housing and is in fluid communication with an inlet.
[0207] According to another aspect of the present disclosure, a controller is communicatively coupled with a manifold assembly. The controller is configured to activate the manifold assembly to adjust a position of a connector to provide at least one of turn assist, pulmonary therapy, and lateral pressure redistribution
[0208] According to another aspect of the present disclosure, a controller is configured to communicate information relating to said pneumatic system to a remote user device.
[0209] According to another aspect of the present disclosure, a motor is configured to rotate a connector between the multiple positions. The connector is configured to initially be rotated at a first speed and then at a second speed when approaching one of the multiple positions. The second speed is slower than the first speed.
[0210] According to another aspect of the present disclosure, a manifold assembly for a mattress includes a manifold core configured to be disposed within an interior of said mattress. The manifold core includes an inlet tube extending from a first side thereof and outlet tubes extending from a second side thereof. The inlet tube defines an inlet and each of the outlet tubes defines an outlet. An engagement surface of the manifold core defines an inlet-connecting aperture in fluid communication with the inlet and defines outlet-connecting apertures in fluid communication with outlets. A connector is rotatably coupled to the manifold core. The connector abuts the manifold core to define an airflow passage. A position of the connector determines which of the outlets is in

fluid communication with the inlet. A motor assembly has a motor and a driveshaft. The driveshaft extends through the manifold core and the connector. A retaining pin extends through the driveshaft to couple the motor assembly to the connector. An optical switch is disposed proximate to the connector. The optical switch is configured to sense the position of the connector.
[0211] According to another aspect of the present disclosure, a manifold assembly includes a sealant to form airtight engagements.
[0212] According to another aspect of the present disclosure, a sealant is grease.
[0213] According to another aspect of the present disclosure, a motor is configured to rotate a connector in two opposing directions to adjust a connector between multiple positions.
[0214] According to another aspect of the present disclosure, multiple positions include a block position to prevent fluid communication between an inlet and any outlets and connecting positions that selectively allow fluid engagement between the inlet and at least one of the outlets.
[0215] According to another aspect of the present disclosure, multiple positions include release positions configured to release fluid from at least one bladder in fluid communication with said manifold assembly.
[0216] According to another aspect of the present disclosure, a method of installing a pneumatic system within support surface assembly includes positioning a manifold assembly within a housing. The manifold assembly has a connector rotatably coupled to a manifold core and configured to rotate in two directions to provide a plurality of airflow paths between an inlet tube of the manifold core and outlet tubes of the manifold core. A blower is positioned within the housing. The blower is in fluid communication with an inlet of the manifold assembly. The housing is positioned within an interior of a mattress. Bladders are positioned within the mattress. The bladders are coupled to outlets of the manifold assembly. The interior of the mattress is enclosed.
[0217] According to another aspect of the present disclosure, a step of positioning bladders includes arranging the bladders in two pairs with each pair on an opposing side of a longitudinal axis of a mattress.
[0218] According to another aspect of the present disclosure, a step of positioning a housing in an interior includes coupling the housing to a control box positioned within a mattress.
[0219] According to another aspect of the present disclosure, a step of enclosing an interior includes coupling an upper covering portion with a base covering portion to obscure bladders and a housing from view.
[0220] According to another aspect of the present disclosure, a method for treating a patient with a pneumatic system includes providing a support surface assembly having a manifold assembly disposed within an interior of the support surface assembly and in fluid communication with bladders. A protocol relating to said pneumatic system is selected. A connector of the manifold assembly is adjusted to a first position. A blower is activated to direct fluid through the manifold assembly. The connector is adjusted to a subsequent position. The bladders are adjusted between a deployed state and a non-deployed state based on the protocol.
[0221] According to another aspect of the present disclosure, a step of adjusting bladders includes adjusting the bladders to provide at least one of turn assist, pulmonary therapy, and lateral pressure redistribution.
[0222] According to another aspect of the present disclosure, a method includes adjusting a parameter of a pneumatic system.
[0223] According to another aspect of the present disclosure, a method includes providing an alert message relating to a pneumatic system.
[0224] A means for supporting a patient includes a first support means having a supporting surface. A second support means disposed on the supporting surface. The second support means defines an interior. Inflation means disposed within the interior of the second support means. A means for adjusting is disposed within the interior of the second support means. The means for adjusting is in fluid communication with the inflation means. The means for adjusting includes a coupling means

having an inlet and multiple outlets. Each inflation means is in fluid communication with one of the outlets. A direction means is coupled to the coupling means. Wherein the direction means has an inner side defining a recessed region. The inner side abuts the coupling means. A driving means configured to rotate the direction means relative to the coupling means to fluidly couple the inlet with at least one of the outlets via an airflow passage defined at least partially by the recessed region.

[0225] Related applications, for example those listed herein, are fully incorporated by reference. Assertions within the related applications are intended to contribute to the scope and interpretation of the information disclosed herein. Any changes between any of the related applications and the present disclosure are not intended to limit the scope or interpretation of the information disclosed herein, including the claims. Accordingly, the present application includes the scope and interpretation of the information disclosed herein as well as the scope and interpretation of the information in any or all of the related applications.

[0226] It will be understood by one having ordinary skill in the art that construction of the described disclosure and other components is not limited to any specific material. Other exemplary embodiments of the disclosure disclosed herein may be formed from a wide variety of materials, unless described otherwise herein.

[0227] For purposes of this disclosure, the term “coupled” (in all of its forms, couple, coupling, coupled, etc.) generally means the joining of two components (electrical or mechanical) directly or indirectly to one another. Such joining may be stationary in nature or movable in nature. Such joining may be achieved with the two components (electrical or mechanical) and any additional intermediate members being integrally formed as a single unitary body with one another or with the two components. Such joining may be permanent in nature or may be removable or releasable in nature unless otherwise stated.

[0228] It is also important to note that the construction and arrangement of the elements of the disclosure, as shown in the exemplary embodiments, is illustrative only. Although only a few embodiments of the present innovations have been described in detail in this disclosure, those skilled in the art who review this disclosure will readily appreciate that many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes, and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter recited. For example, elements shown as integrally formed may be constructed of multiple parts, or elements shown as multiple parts may be integrally formed, the operation of the interfaces may be reversed or otherwise varied, the length or width of the structures and/or members or connector or other elements of the system may be varied, the nature or number of adjustment positions provided between the elements may be varied. It should be noted that the elements and/or assemblies of the system may be constructed from any of a wide variety of materials that provide sufficient strength or durability, in any of a wide variety of colors, textures, and combinations. Accordingly, all such modifications are intended to be included within the scope of the present innovations. Other substitutions, modifications, changes, and omissions may be made in the design, operating conditions, and arrangement of the desired and other exemplary embodiments without departing from the spirit of the present innovations.

[0229] It will be understood that any described processes or steps within described processes may be combined with other disclosed processes or steps to form structures within the scope of the present disclosure. The exemplary structures and processes disclosed herein are for illustrative purposes and are not to be construed as limiting.

Claims

1. A mattress, comprising: a covering defining an interior; multiple bladders disposed within the interior; and a manifold assembly disposed within the interior, wherein the manifold assembly includes: a manifold core having an inlet tube extending from a first side thereof and defining an inlet, wherein the manifold core has outlet tubes extending from a second side thereof, each outlet tube defining an outlet, wherein each of the multiple bladders is in fluid communication with one of the outlets; and a connector coupled to the manifold core, wherein the connector is configured to rotate between multiple positions to adjust a fluid communication between the inlet and at least one of the outlets; and a blower disposed within the interior of the mattress and in fluid communication with the inlet of the manifold assembly.
2. The mattress of claim 1, wherein the connector is configured to rotate in a range between 80 degrees and 85 degrees in a first direction from to an initial position to a first connecting position which fluidly couples the inlet with one of the outlets, and wherein a first bladder of the multiple bladders is adjusted between a deployed state and a non-deployed state when the connector is in the first connecting position.
3. The mattress of claim 2, wherein the connector is configured to rotate in a range between 120 degrees and 130 degrees in the first direction from the initial position to be in a second connecting position which fluidly couples the inlet with two of the outlets, and wherein the first bladder and a second bladder of the multiple bladders are adjusted between the deployed state and the non-deployed state when the connector is in the second connecting position.
4. The mattress of claim 1, wherein the connector defines a recessed region, wherein the manifold core defines outlet-connecting apertures in fluid communication with the outlets, and wherein a position of the recessed region determines which of the outlet-connecting apertures are in fluid communication with the inlet and, consequently, which of the multiple bladders are adjusted between a deployed state and a non-deployed state.
5. The mattress of claim 1, wherein the connector defines a release aperture configured to allow fluid to be released from at least one of the multiple bladders when the connector is in a release position.
6. The mattress of claim 1, wherein the multiple positions include a first connecting position and a second connecting position, and wherein the connector is configured to rotate in a first direction from an initial position to reach the first connecting position and a second direction from the initial position to reach the second connecting positions.
7. The mattress of claim 1, wherein the connector is configured to block the fluid communication between the inlet and each of the outlets when in an initial position.
8. The mattress of claim 1, further comprising: a controller communicatively coupled with the manifold assembly, wherein the controller is configured to activate the manifold assembly to adjust a position of the connector to provide at least one of turn assist, pulmonary therapy, and lateral pressure redistribution.
9. The mattress of claim 1, further comprising: a housing disposed within the interior of the cover, wherein the manifold assembly is disposed within the housing.
10. A mattress, comprising: a covering defining an interior; multiple bladders disposed within the interior; a housing defining an interior and positioned within the interior of the covering; a manifold assembly disposed within the interior of the housing, wherein the manifold assembly includes: a manifold core defining an inlet and outlets, wherein each of the multiple bladders is in fluid communication with one of the outlets, and wherein the manifold core includes an engagement surface that defines an inlet-connecting aperture in fluid communication with the inlet and outlet-connecting apertures in fluid communication with the outlets, respectively; and a connector coupled to the manifold core, wherein the connector is configured to rotate between multiple positions to adjust a fluid communication between the inlet and at least one of the outlets via a passage across the engagement surface between the inlet-connecting aperture and at least one

of the outlet-connecting apertures; and a blower disposed within the interior of the housing and in fluid communication with the inlet of the manifold assembly to direct air through the inlet, through the inlet-connecting aperture, through the passage, and through at least one of the outlet-connecting apertures.

11. The mattress of claim 10, wherein the connector includes a recessed region at least partially defining the passage across the engagement surface, and wherein a position of the recessed region relative to the engagement surface determines which of the outlet-connecting apertures are in fluid communication with the inlet and, consequently, which of the multiple bladders are adjusted between a deployed state and a non-deployed state.

12. The mattress of claim 10, wherein the connector defines a release aperture configured to allow fluid to be released from at least one of the multiple bladders when the connector is in a release position.

13. The mattress of claim 10, further comprising: an intake tube coupled with the blower, wherein the intake tube is in fluid communication with the interior of the covering via an aperture in the housing.

14. The mattress of claim 10, further comprising: a controller communicatively coupled with the manifold assembly, wherein the controller is configured to activate the manifold assembly to adjust a position of the connector to provide at least one of turn assist, pulmonary therapy, and lateral pressure redistribution.

15. The mattress of claim 10, further comprising: a motor configured to rotate the connector between the multiple positions.

16. A pneumatic system for a mattress, comprising: bladders operable between a deployed state and a non-deployed state; a housing configured to be disposed within an interior of said mattress; and a manifold assembly disposed within the housing and in fluid communication with the bladders, wherein the manifold assembly includes: a manifold core having an inlet and outlets, wherein an engagement surface of the manifold core defines an inlet-connecting aperture in fluid communication with the inlet and defines outlet-connecting apertures each in fluid communication with one of the outlets; and a connector rotatably coupled to the manifold core, wherein the connector is configured to rotate between multiple positions relative to the manifold core to fluidly couple the inlet-connecting aperture with at least one of the outlet-connecting apertures.

17. The pneumatic system of claim 16, further comprising: a blower disposed within the housing and in fluid communication with the inlet.

18. The pneumatic system of claim 16, further comprising: a controller communicatively coupled with the manifold assembly, wherein the controller is configured to activate the manifold assembly to adjust a position of the connector to provide at least one of turn assist, pulmonary therapy, and lateral pressure redistribution.

19. The pneumatic system of claim 18, wherein the controller is configured to communicate information relating to said pneumatic system to a remote user device.

20. The pneumatic system of claim 16, further comprising: a motor configured to rotate the connector between the multiple positions, wherein the connector is configured to initially be rotated at a first speed and then at a second speed when approaching one of the multiple positions, the second speed being slower than the first speed.