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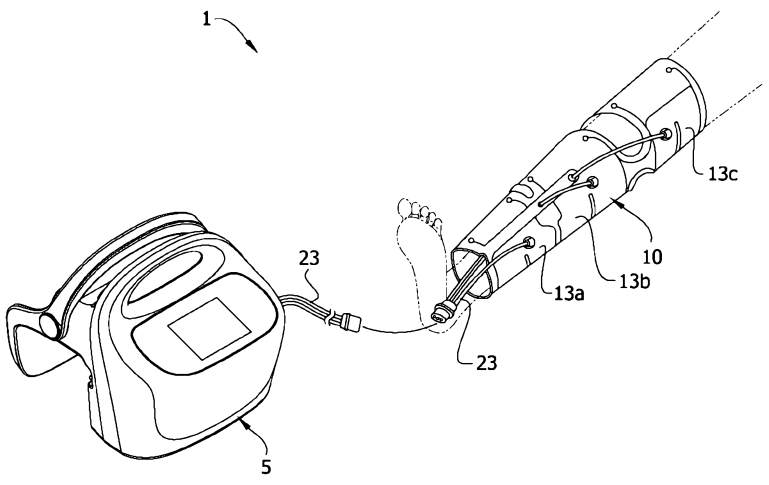
(54) Title: COMPRESSION GARMENT INFLATION

FIG. 1



(57) Abstract: A test inflation cycle of fluid flow is controlled from a fluid source to each inflatable bladder of a plurality of inflatable bladders of a compression garment. Pressure signals from at least one pressure sensor are received and compared to one or more reference pressure values. One or more inflation parameters of at least one of the inflatable bladders is set based at least in part on the comparison of the pressure signals, and the inflatable bladders are inflated to a respective second pressure greater than the corresponding test inflation pressure of each bladder based at least in part on the set one or more inflation parameters.

COMPRESSION GARMENT INFLATION

BACKGROUND

[0001] Conventional vascular compression systems include a compression garment fluidly connected to a fluid source, for cyclically inflating the compression garment. The cyclical inflation of the compression garment enhances blood circulation and decreases the likelihood of deep vein thrombosis (DVT). A controller controls operation of the fluid source to deliver fluid to bladders of the compression garment to produce bladder pressure along the compression garment. The manner in which the compression garment is applied to the wearer's limb, the size and shape of the wearer's limb, and the wearer's activity during use of the compression garment can affect the gradient of the bladder pressure that is actually applied to the limb, potentially creating a disparity between a target gradient bladder pressure and the actual gradient bladder pressure applied to the limb.

SUMMARY

[0002] The present disclosure is directed to systems and methods of increasing the likelihood that a target therapeutic pressure gradient will, under a variety of conditions, be applied by a compression garment to a limb of a patient.

A first aspect of the present invention provides a compression device controller comprising:

one or more processors;

computer executable instructions embodied on a computer readable storage medium, the computer executable instructions including instructions for causing the one or more processors to:

control a non-therapeutic test inflation cycle of fluid flow from a fluid source to each inflatable bladder of a plurality of inflatable bladders of a compression garment;

receive a plurality of pressure signals from at least one pressure sensor, each pressure signal indicative of a corresponding non-therapeutic test inflation pressure in the respective inflatable bladder during the non-therapeutic test inflation cycle;

vent each inflatable bladder to reduce the pressure in the inflatable bladder to atmospheric pressure or to a residual pressure prior to inflation of another inflatable bladder such that the test inflation cycles of each of the inflatable bladders do not overlap;

compare the received pressure signals to one or more reference pressure values;

based at least in part on the comparison of the pressure signals to one or more reference pressure values, set one or more inflation parameters of at least one of the plurality of inflatable bladders for a therapeutic compression treatment; and

based at least in part on the set one or more therapeutic inflation parameters, inflate the inflatable bladders to a respective second inflation pressure greater than the corresponding non-therapeutic test inflation pressure of each inflatable bladder to impart the therapeutic compression treatment.

A second aspect of the present invention provides a compression system comprising:

a compression garment including inflatable bladders;

valves actuatable to control fluid flow from a fluid source to the inflatable bladders;

at least one pressure sensor positionable, through actuation of the valves, in pneumatic communication with each inflatable bladder; and

a controller in electrical communication with the at least one pressure sensor and the valves, the controller comprising one or more processors, a computer readable storage medium, and computer executable instructions embodied on the computer readable storage medium, the computer executable instructions including instructions for causing the one or more processors to:

control a non-therapeutic test inflation cycle of fluid flow from the fluid source to each inflatable bladder;

receive a plurality of pressure signals from the at least one pressure sensor, each pressure signal indicative of the corresponding non-therapeutic test inflation pressure in the respective inflatable bladder;

vent each inflatable bladder to reduce the pressure in the inflatable bladder to atmospheric pressure or to a residual pressure prior to inflation of another inflatable bladder such that the test inflation cycles of each of the inflatable bladders do not overlap;

compare the received pressure signals to one or more reference pressure values;

based at least in part on the comparison of the plurality of pressure signals to the one or more reference pressure values, set one or more therapeutic inflation parameters of at least one of the inflatable bladders for a therapeutic compression treatment; and

based at least in part on the set one or more therapeutic inflation parameters, inflate the

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inflatable bladders to a respective second inflation pressure greater than the corresponding non-therapeutic test pressure of each bladder to impart the therapeutic compression treatment.

A third aspect of the present invention provides a computer-implemented method of controlling inflation of a compression garment, the computer-implemented method comprising:

controlling a non-therapeutic test inflation cycle of fluid flow from a fluid source to each inflatable bladder of a plurality of inflatable bladders;

receiving a plurality of pressure signals from at least one pressure sensor, each pressure signal indicative of the corresponding non-therapeutic test inflation pressure in the respective inflatable bladder;

venting each inflatable bladder to reduce the pressure in the inflatable bladder to atmospheric pressure or to a residual pressure prior to inflation of another inflatable bladder such that the test inflation cycles of each of the inflatable bladders do not overlap;

comparing the received plurality of pressure signals to one or more reference pressure values;

based at least in part on the comparison of the plurality of pressure signals to the one or more reference pressure values, setting one or more therapeutic inflation parameters of at least one of the inflatable bladders for a therapeutic compression treatment; and

based at least in part on the set one or more therapeutic inflation parameters, inflating the inflatable bladders to a respective second inflation pressure greater than the corresponding non-therapeutic test pressure of each bladder to impart the therapeutic compression treatment.

[0003] In general, in one aspect, a test inflation cycle of fluid flow is controlled from a fluid source to each inflatable bladder of a plurality of inflatable bladders of a compression garment. Pressure signals from at least one pressure sensor are received and compared to one or more reference pressure values. One or more inflation parameters of at least one of the inflatable bladders is set based at least in part on the comparison of the pressure signals, and the inflatable bladders are inflated to a respective second pressure greater than the corresponding test inflation pressure of each bladder based at least in part on the set one or more inflation parameters.

[0004] In some embodiments, comparing the received pressure signals to one or more reference pressure values includes comparing the received pressure signals to each other. Additionally, or alternatively, comparing the received pressure signals to one or more reference

pressure values can include comparing the received pressure signals to predetermined pressure values.

[0005] In certain embodiments, comparing the received pressure signals to one or more reference pressure values includes ranking the corresponding inflatable bladders relative to one another and setting the one or more inflation parameters includes adjusting the one or more inflation parameters based at least in part on the relative ranking of the inflatable bladders.

[0006] In some embodiments, the test inflation pressure of each bladder is less than about 20 mmHg and the second inflation pressure of each bladder is greater than about 25 mmHg.

[0007] In another aspect a compression device controller includes one or more processors and computer executable instructions embodied on a computer readable storage medium. The computer executable instructions include instructions for causing the one or more processors to control a test inflation cycle of fluid flow from a fluid source to each inflatable bladder of a plurality of inflatable bladders of a compression garment, receive a plurality of pressure signals from at least one pressure sensor, compare the received pressure signals to one or more reference pressure values, set one or more inflation parameters of at least one of the inflatable bladders, and inflate the inflatable bladders to a respective second pressure greater than the corresponding test inflation pressure of each bladder. Each pressure signal is indicative of a corresponding test inflation pressure in the respective inflatable bladder during the test inflation cycle. Setting the one or more inflation parameters of at least one of the inflatable bladders is based at least in part on the comparison of the pressure signals. Inflating the inflatable bladders to the respective second pressure is based at least in part on the set one or more inflation parameters.

[0008] In some embodiments, the instructions to receive pressure signals include instructions to rank the corresponding inflatable bladders relative to one another and the instructions to set one or more inflation parameters include instructions to adjust the one or more inflation parameters based at least in part on the relative ranking of the inflatable bladders. The instructions to set the one or more inflation parameters can include instructions to adjust the one or more inflation parameters if the relative ranking of the inflatable bladders does not match a set ranking of the inflatable bladders.

[0009] In certain embodiments, the instructions to set the one or more inflation parameters include instructions to set the one or more inflation parameters based on a predetermined pressure gradient of the respective second pressures of the inflatable bladders.

[0010] In some embodiments, the instructions to compare the received pressure signals to one or more reference pressure values include instructions to compare the received pressure signals to each other. Additionally, or alternatively, the instructions to compare the received pressure signals to one or more reference pressure values can include instructions to compare the received pressure signals to predetermined pressure values.

[0011] In certain embodiments, the instructions to compare the received pressure signals to one or more reference pressure values includes instructions to compare an average of a plurality of pressure signals of a respective inflatable bladder to one or more reference pressure values.

[0012] In some embodiments, the test inflation pressure of each bladder is less than about 20 mmHg and the second inflation pressure of each bladder is greater than about 25 mmHg.

[0013] In certain embodiments, the instructions to control the test inflation cycle of fluid flow to each inflatable bladder includes instructions to control one or more of a test inflation time and a test inflation flow rate to each respective bladder.

[0014] In some embodiments, the instructions to control the test inflation cycle of fluid flow to each inflatable bladder include instructions to initiate the test inflation bladder at a regular interval. Additionally, or alternatively, the computer readable storage medium can further include instructions for causing the one or more processors determine a vascular refill time associated with a limb of a subject, and the instructions to control the test inflation cycle of fluid flow to each inflatable bladder are initiated based at least in part on a change in the vascular refill time associated with the limb of the subject.

[0015] In certain embodiments, the instructions to control the test inflation cycle of fluid flow to each inflatable bladder include instructions to inflate and deflate one inflatable bladder at a time. Additionally, or alternatively, the instructions to control the test inflation cycle of fluid flow to each inflatable bladder can include instructions to inflate and deflate each inflatable bladder in sequence, one after another.

[0016] In some embodiments, each pressure signal is received generally at an end of the test inflation cycle of the respective inflatable bladder.

[0017] In yet another aspect, a compression system includes a compression garment including inflatable bladders, valves, at least one pressure sensor, and a controller in electrical communication with the at least one pressure sensor and the valves. The valves are actuatable to control fluid flow from a fluid source to the inflatable bladders, and the at least one pressure sensor is positionable, through actuation of the valves, in pneumatic communication with each inflatable bladder. The controller includes one or more processors, a computer readable storage medium, and computer executable instructions embodied on the computer readable storage medium. The computer executable instructions include instructions for causing the one or more processors to control a test inflation cycle of fluid flow from a fluid source to each inflatable bladder, receive a plurality of pressure signals from at least one pressure sensor, compare the received pressure signals to one or more reference pressure values, set one or more inflation parameters of at least one of the inflatable bladders, and inflate the inflatable bladders to a respective second pressure greater than the corresponding test pressure of each bladder. Each pressure signal is indicative of the corresponding test inflation pressure in the respective inflatable bladder. Setting the one or more inflation parameters of at least one of the inflatable bladders is based at least in part on the comparison of the pressure signals, and inflating the inflatable bladders to a respective second pressure is based at least in part on the set one or more inflation parameters.

[0018] In another aspect, a system includes means for controlling a test inflation cycle of fluid flow from a fluid source to each inflatable bladder of a plurality of inflatable bladders, means for receiving a plurality of pressure signals from at least one pressure sensor, means for comparing the received pressure signals to one or more reference pressure values, means for setting one or more inflation parameters of at least one of the inflatable bladders, and

means for inflating the inflatable bladders to a respective second pressure greater than the corresponding test pressure of each bladder. Each pressure signal is indicative of the corresponding test inflation pressure in the respective inflatable bladder. The setting is based at least in part on the comparison of the pressure signals, and the inflating of the inflatable bladders to the respective second pressure is based at least in part on the set one or more inflation parameters.

[0019] In certain embodiments, the system further includes means for determining a vascular refill time associated with a limb of a subject, and the means for controlling the test inflation cycle of fluid flow to each inflatable bladder is responsive to a change in the vascular refill time associated with the limb of the subject.

[0020] Embodiments can include one or more of the following advantages.

[0021] In some embodiments, one or more inflation parameters of at least one of the inflatable bladders is set based at least in part on the comparison of the pressure signals indicative of the corresponding test inflation pressure in the respective inflatable bladders during the test inflation cycle. As compared to compression systems operating on the assumption that the internal volume of an inflatable bladder remains unchanged after application of a compression garment to a wearer's limb, the setting of one or more inflation parameters based at least in part on the comparison of test inflation pressures can increase the likelihood that, under a variety of conditions, an appropriate pressure gradient will be applied to the limb of the wearer during a therapeutic compression cycle. Additionally, or alternatively, as compared to compression systems that assume an unchanged internal volume of inflatable bladders, the use of the test inflation pressure to set the one or more inflation parameters of one or more inflatable bladders for subsequent inflation to the second, greater pressure can facilitate control over the upper limit of therapeutic compression pressure applied to the limb of the wearer.

[0022] In certain embodiments, controlling the test inflation cycle of fluid flow to each inflatable bladder includes to initiate the test inflation cycle to each bladder at a regular interval. As compared to compression systems operating on the assumption that the internal volume of an inflatable bladder remains unchanged after application of a compression garment to a wearer's limb, initiating the test inflation cycle to each bladder at a regular interval can reduce the likelihood that a therapeutic compression gradient applied to a wearer's limb will shift over time.

[0023] In some embodiments, controlling the test inflation cycle of fluid flow to each inflatable bladder is initiated based at least in part on a change in a condition (e.g., vascular refill time) associated with the limb of a wearer. As compared to compression systems operating on the assumption that the internal volume of an inflatable bladder remains unchanged after application of a compression garment to a wearer's limb, initiating the test inflation cycle to each bladder based on a change in a measured condition will facilitate adjusting inflation parameters shortly after a change in the condition occurs such that the time associated. Such responsive

initiation of the test inflation cycle can result in more efficient application of therapeutic compression to the limb of a wearer by increasing the amount of time that an appropriate therapeutic compression gradient is applied to the limb of the wearer.

[0024] Other aspects, features, and advantages will be apparent from the description and drawings, and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] FIG. 1 is a perspective of a compression system including a compression garment and a controller.

[0026] FIG. 2 is a schematic of the compression system of FIG. 1, including a schematic of a pneumatic circuit.

[0027] FIG. 3 is a flow chart of a non-therapeutic test inflation cycle performed by the compression system of FIG. 1.

[0028] FIG. 4 is a graphical illustration of a pressure profile produced by the compression system of FIG. 1 during the non-therapeutic test inflation cycle.

[0029] FIGS. 5A-5B are tables identifying the inflation parameter action associated with a pressure comparison during the test inflation cycle.

[0030] Corresponding reference characters indicate corresponding parts throughout the drawings.

DETAILED DESCRIPTION

[0031] As used herein, the terms "proximal" and "distal" represent relative locations of components, parts and the like of a compression garment when the garment is worn. For example, a "proximal" component is disposed most adjacent to the wearer's torso, a "distal" component is disposed most distant from the wearer's torso, and an "intermediate" component is disposed generally anywhere between the proximal and distal components.

[0032] Referring to Figs. 1 and 2, a compression system 1 includes a compression garment 10 for applying sequential compression therapy to a limb of a wearer and a controller 5 having one or more processors 7 and computer executable instructions embodied on a computer readable storage medium 33, the computer executable instructions including instructions for causing the one or more processors to control operation of the compression garment 10. The compression garment 10 includes a distal inflatable bladder 13a, an intermediate inflatable bladder 13b, and a proximal inflatable bladder 13c. The compression garment 10 can be of a

substantially one-size-fits-all configuration with respect to the circumferences of different wearers' legs (e.g., with an inner surface and an outer surface of the compression garment 10 secured to one another through the use of hook and loop fasteners).

[0033] As described in further detail below, the controller 5 controls operation of the compression garment 10 to perform a test inflation cycle, in which the inflatable bladders 13a, 13b, 13c are inflated to a non-therapeutic pressure (e.g., less than about 20 mmHg) to verify and, if necessary, adjust the gradient pressure applied to the wearer's limb by the inflatable bladders 13a, 13b, 13c of the compression garment 10 during one or more subsequent therapeutic compression cycles. As compared to compression systems that do not adjust gradient pressure, the adjustment of the gradient pressure based on a test inflation cycle of the inflatable bladders 13a, 13b, 13c can, for example, increase the likelihood that an appropriate compression gradient is applied to a limb of a wearer during therapeutic compression cycles through variations associated with the position of the wearer's limb and/or fit of the compression garment 10.

[0034] The compression garment 10 is a thigh-length sleeve positionable around the leg of the wearer, with the distal bladder 13a around the wearer's ankle, the intermediate bladder 13b around the wearer's calf, and the proximal bladder 13c around the wearer's thigh. The inflatable bladders 13a, 13b, 13c expand and contract under the influence of air pressure or other fluids delivered from a pressurized fluid source 21 in electrical communication with the controller 5. The pressurized fluid source 21 delivers pressurized fluid (e.g., air) to the inflatable bladders 13a, 13b, 13c through tubing 23.

[0035] Referring to Fig. 2, each inflatable bladder 13a, 13b, 13c is in fluid communication with a respective valve 25a, 25b, 25c. A pressure sensor 27 is in communication (e.g., fluid communication and/or mechanical communication) with the manifold 29 to measure pressure in the manifold 29. Fluid communication between the manifold 29 and the respective inflatable bladders 13a, 13b, 13c can be controlled through control of the position of the respective valves 25a, 25b, 25c (e.g., through activation and/or deactivation of the respective valves 25a, 25b, 25c). The pressure sensor 27 is in electrical communication with the controller 5 to deliver to the controller 5 signals indicative of the measured pressure of the manifold 29 and/or one or more of the inflatable bladders 13a, 13b, 13c in fluid communication with the manifold 29 as a result of the positions of the respective valves 25a, 25b, 25c. For example, the pressure sensor 27 measures pressure in the combined volume of the manifold 29 and the

inflatable bladder 13a when valve 25a is open and valves 25b, 25c are closed. The volume of the manifold 29 is fixed. Accordingly, for a given volume of air, changes in pressure measured by the pressure sensor 27 for a given inflatable bladder 13a, 13b, 13c reflects a change in volume of the respective inflatable bladder 13a, 13b, 13c.

[0036] Each valve 25a, 25b, 25c is a 3-way/2-position, normally closed, solenoid valve. Each of these valves includes three ports and is actuatable to place a first port (an inlet port) in fluid communication with a second port (a bladder port) in a first position. Each valve is further actuatable to place the second port in fluid communication with a third port (vent port) in a second position. The first port of each valve 25a, 25b, 25c is in fluid communication with the pressurized fluid source 21 and the manifold 29. The second port of each valve 25a, 25b, 25c is in fluid communication with a respective inflatable bladder 13a, 13b, 13c, and the third port is in fluid communication with ambient atmosphere. It should be appreciated that the valves 25a, 25b, 25c could be other types and have other arrangements within the compression system 1 without departing from the scope of the present disclosure.

[0037] Referring now to FIGS. 2 and 4, the computer executable instructions embodied on the computer readable storage medium 33 cause the one or more processors 7 to pressurize (e.g., inflate) the inflatable bladders 13a, 13b, 13c to provide cyclical therapeutic compression pressure to a wearer's limb. For example, in a phase of the therapeutic compression cycle known as the inflation phase, the computer executable instructions embodied on the computer readable storage medium 33 cause the one or more processors 7 to control the pressurized fluid source 21 and/or the valves 25a, 25b, 25c to pressurize the inflatable bladders 13a, 13b, 13c to therapeutic compression pressures (e.g., about 25 mmHg and above) for a predetermined amount of time to move the blood in the limb from regions underlying the inflatable bladders 13a, 13b, 13c. Following the inflation phase, in a phase of the therapeutic compression cycle known as the vent phase, the computer executable instructions may cause the one or more processors 7 to control the pressurized fluid source 21 and/or the valves 25a, 25b, 25c to reduce the pressure in the inflatable bladders 13a, 13b, 13c to atmospheric pressure.

[0038] Additionally, or alternatively, the computer executable instructions may cause the one or more processors 7 to control the pressurized fluid source 21 and/or the valves 25a, 25b, 25c to reduce the pressure in the inflatable bladders 13a, 13b, 13c to a residual pressure (e.g., about 6 mmHg to about 8 mmHg). With the inflatable bladders 13a, 13b, 13c inflated to

the residual pressure, blood can reenter the regions of the limb underlying the inflatable bladders 13a, 13b, 13c. The pressure in the inflatable bladders 13a, 13b, 13c can be sensed by the pressure sensor 27 until it is determined that blood flow has been completely restored to the regions of the limb underlying the inflatable bladders 13a, 13b, 13c. The time elapsed from the onset of the vent phase until blood flow is restored is measured by a timer 31 of the controller 5 and stored in the computer readable storage medium 33. This time associated with restoration of blood flow in regions of the limb underlying the inflatable bladders 13a, 13b, 13c is known as the venous refill time. The interval between successive initiations of the therapeutic compression cycle can be adjusted based on the venous refill time associated with the wearer of the compression garment 10.

[0039] In some embodiments, the pressure gradient during the inflation phase of the therapeutic compression cycle decreases from the distal inflatable bladder 13a to the proximal inflatable bladder 13c. For example, the distal inflatable bladder 13a can be inflated to about 45 mmHg, the intermediate inflatable bladder 13b can be inflated to about 40 mmHg, and the proximal inflatable bladder 13c can be inflated to about 30 mmHg during the inflation phase of the therapeutic compression cycle. It should be appreciated that the operation of the controller 5 to perform a test inflation cycle to adjust the compression gradient of the inflatable bladders 13a, 13b, 13c can facilitate maintaining this compression gradient through variations associated with the position of the wearer's limb and/or fit of the compression garment 10. For example, the operation of the controller 5 to perform a test inflation cycle to adjust the compression gradient of the inflatable bladders 13a, 13b, 13c can reduce the likelihood of the occurrence of a reverse gradient condition (a condition in which the pressure gradient increases from the distal inflatable bladder 13a to the proximal inflatable bladder 13c), which works against the desired therapeutic effect of the compression garment 10.

[0040] Fig. 3 schematically depicts an example of a method 35 of controlling inflation of a compression garment to perform a test inflation cycle to set one or more therapeutic inflation parameters (e.g., time of inflation and/or rate of inflation) of at least one of the inflatable bladders of the compression garment. For ease of description, the method 35 of controlling inflation of a compression garment is described with respect to the compression system 1 shown in Figs. 1 and 2. It should be appreciated, however, that the method 35 can be implemented

using any of various different hardware and software configurations without departing from the scope of the present disclosure.

[0041] Referring now to Figs. 1-5A, the computer executable instructions embodied on the computer readable storage medium 33 cause the one or more processors 7 to execute the method 35 of controlling inflation of the compression garment 10. In an exemplary embodiment described in further detail below, the computer executable instructions embodied on the computer readable storage medium 33 cause the one or more processors 7 to control 40 a test inflation cycle in each of the inflatable bladders 13a, 13b, 13c, receive 50 from the pressure sensor 27 a plurality of pressure signals indicative of a corresponding test inflation pressure in the inflatable bladders 13a, 13b, 13c, compare 60 the received pressure signals to one or more reference values, set 80 one or more inflation parameters based at least in part on the comparison 60, and inflate 90 the inflatable bladders 13a, 13b, 13c, based on the one or more set 80 inflation parameters, to a second pressure greater than the corresponding test inflation pressure of each inflatable bladder 13a, 13b, 13c.

[0042] The control 40 of the test inflation cycle in each of the inflatable bladders 13a, 13b, 13c includes controlling fluid flow from the pressurized fluid source 21 to each of the inflatable bladders 13a, 13b, 13c. For example, the one or more processors 7 can execute instructions to open one of the valves 25a, 25b, 25c for a set amount of time using the timer 31 electrically connected to the one or more processors 7, and deliver pressurized fluid to one of the inflatable bladders 13a, 13b, 13c via the pressurized fluid source 21 at a set rate to inflate the inflatable bladder for the test inflation cycle. The set amount of time each valve 25a, 25b, 25c is open and the rate the pump 21 delivers pressurized fluid to the respective bladders 13a, 13b, 13c is such that a test inflation pressure in each inflatable bladder will be less than about 20 mmHg and greater than about 5 mmHg. An inflatable bladder pressure of less than about 20 mmHg is considered to be a non-therapeutic inflation pressure because pressures of this amount are generally understood as unsuitable for moving a therapeutically effective amount of blood in a wearer's limb. An inflatable bladder pressure of greater than about 5 mmHg is generally understood to be suitable for accurate control and measurement.

[0043] The control 40 of the test inflation cycle can additionally or alternatively include operating a corresponding valve (e.g., valve 25a) to position the pressure sensor 27 to measure a pressure in one inflatable bladder (e.g., distal inflatable bladder 13a) via the manifold

29 at or immediately after a set amount of time has expired and while the valve 25a is still open. The pressure sensor 27 provides a pressure signal P_d indicative of the measured test inflation pressure of the inflatable bladder 13a and for use by the controller 5. After pressurizing the bladder 13a to the test inflation pressure, the one or more processors 7 may execute instructions to vent the inflatable bladder 13a to reduce the pressure in the inflatable bladder 13a to atmospheric pressure or to a residual pressure (e.g., less than about 20 mmHg). The one or more processors 7 execute analogous instructions related to the inflatable bladders 13b, 13c. Accordingly, the pressure sensor 27 also provides a pressure signal P_i indicative of the measured test inflation pressure of the inflatable bladder 13b and a pressure signal P_p indicative of the measured test inflation pressure of the inflatable bladder 13c.

[0044] The test inflation cycle can be performed separately for each of the inflatable bladders 13a, 13b, 13c to measure the respective pressure signal P_d, P_i, P_p for each of the inflatable bladders 13a, 13b, 13c. For example, the one or more processors 7 can execute instructions such that the test inflation cycle of each of the inflatable bladders 13a, 13b, 13c do not overlap. The separate test inflation cycle of the inflatable bladders 13a, 13b, 13c can facilitate, for example, monitoring and identifying anomalies associated with each individual bladder 13a, 13b, 13c.

[0045] In certain embodiments, the control 40 of the test inflation cycle in the inflatable bladders 13a, 13b, 13c includes inflating and deflating each of the inflatable bladders 13a, 13b, 13c in sequence, one after another, without an intervening therapeutic compression cycle. Such sequential test cycles of the inflatable bladders 13a, 13b, 13c, without an intervening therapeutic compression cycle, can improve the accuracy of the comparison of the inflatable bladders 13a, 13b, 13c by, for example, reducing the likelihood that a condition (e.g., position) of the compression garment 10 has shifted in the time between the test cycles of the inflatable bladders 13a, 13b, 13c. In some embodiments, the control 40 of the test inflation cycle in each of the inflatable bladders 13a, 13b, 13c includes controlling a test cycle of one of the inflatable bladders 13a, 13b, 13c following a first therapeutic compression cycle, controlling a test cycle of another of the inflatable bladders 13a, 13b, 13c following a second therapeutic compression cycle, and controlling a test cycle of a final one of the inflatable bladders 13a, 13b, 13c following a third therapeutic compression cycle. No analysis of the received pressure signals P_d, P_i, P_p is done until a test inflation cycle has been performed on each inflatable bladder 13a, 13b, 13c,

after multiple therapeutic compression cycles have taken place, so that data for all three bladders 13a, 13b, 13c is acquired. Such stratification of the test inflation cycles of the inflatable bladders 13a, 13b, 13c can, for example, reduce the contiguous amount of time a wearer of the compression garment 10 is without therapeutic compression treatment.

[0046] The control 40 of the test inflation cycle for each inflatable bladder 13a, 13b, 13c can be initiated at a regular interval. For example, the control 40 of the test inflation cycle for a first of the inflatable bladder 13a, 13b, 13c can be initiated following completion of a first therapeutic cycle after a fixed interval (e.g., 30 minutes) has elapsed. Additionally, or alternatively, the control 40 of the test inflation cycle for a first inflatable bladder 13a, 13b, 13c can be initiated following completion of a first therapeutic cycle after a user-specified (e.g., specified by a clinician through input into the controller 5) regular interval has elapsed. Initiation of the test inflation cycle at a regular interval (e.g., a fixed interval or a user-specified interval) can, for example, facilitate routine monitoring of the gradient pressure profile across the compression garment 10. In some embodiments, the control 40 of the test inflation cycle for each inflatable bladder 13a, 13b, 13c is initiated upon initial connection of the compression garment 10 to the controller 5. Such an initial test inflation cycle can, for example, facilitate checking the connection between the compression garment 10 and the controller 5 and/or checking placement of the compression garment 10 on the limb of the wearer.

[0047] The receipt 50, from the pressure sensor 27, of the plurality of pressure signals P_d, P_i, P_p indicative of a corresponding test inflation pressure in the inflatable bladders 13a, 13b, 13c includes receiving the plurality of pressure signals P_d, P_i, P_p during the test inflation cycle of each respective inflatable bladder 13a, 13b, 13c and storing the plurality of pressure signals P_d, P_i, P_p on the computer readable storage medium 33. The received 50 pressure signals P_d, P_i, P_p can be received generally at an end of the test inflation cycle of the respective inflatable bladder 13a, 13b, 13c. The receipt 50 of pressure signals P_d, P_i, P_p generally at an end of the test inflation cycle can, for example, increase the likelihood that the pressure signal P_d, P_i, P_p is indicative of a stabilized condition in the respective inflatable bladder 13a, 13b, 13c.

[0048] The pressure profile in Fig. 4 represents an ideal test inflation pressure profile recorded during a test inflation cycle where, in the example shown, the pressure signal P_d in the distal inflatable bladder 13a is higher than the pressure signal P_i in the intermediate inflatable bladder 13b, and the pressure signal P_i in the intermediate inflatable bladder 13b is higher than

the pressure signal P_p in the proximal inflatable bladder 13c. It should be appreciated that, in this example, the pressure signals P_d, P_i, P_p reflect a pressure gradient in the compression garment 10. Other types of test inflation pressure profiles during a test cycle (e.g., a profile in which the pressure signals P_d, P_i, P_p are substantially the same (e.g., within 2% of one another)) are within the scope of the present disclosure. In some embodiments, a graphical representation of P_d, P_i, P_p is displayed by the controller 5.

[0049] The received 50 pressure signals P_d, P_i, P_p are compared 60 to one or more reference pressure values. In some embodiments, comparing 60 the received pressure signals P_d, P_i, P_p includes comparing the received pressure signals P_d, P_i, P_p to one another. For example, the one or more processors 7 can rank the received pressure signals P_d, P_i, P_p by determining if P_d is less than or greater than P_i, determining if P_i is less than or greater than P_p, and determining if P_p is less than or greater than P_d. In addition, or as an alternative, to the comparison 60 including a ranking, embodiments based on comparing 60 the received pressure signals P_d, P_i, P_p to one another can include determining whether the values of the received pressure signals P_d, P_i, P_p differ from one another by more than a predetermined amount. For example, the comparison 60 can be based on whether the pressure signals P_d, P_i, P_p differ from one another by a predetermined percentage. Additionally, or alternatively, the comparison 60 can be based on whether one or more of the pressure signals P_d, P_i, P_p differ from one another by a predetermined absolute amount (e.g., specified in mmHg).

[0050] The computer readable storage medium 33 includes computer executable instructions to cause the one or more processors 7 to determine 70 if the comparisons show that the received pressure signals P_d, P_i, P_p are acceptable. For example, if the determination 70 is made that the comparison 60 shows the received pressure signals P_d, P_i, P_p match a set ranking (e.g., $P_d > P_i > P_p$, as is the case in the example shown in Fig. 4) then the inflatable bladders 13a, 13b, 13c have the proper ranking to produce a desired pressure gradient, no adjustments are made, and each inflatable bladder 13a, 13b, 13c is inflated 90 to a second pressure (e.g., a therapeutic compression pressure of greater than about 25 mmHg) greater than the test inflation pressure to impart therapeutic treatment to a limb of a wearer.

[0051] If, however, the determination 70 is made that the comparison 60 shows the received pressure signals P_d, P_i, P_p are not acceptable (e.g., do not match a set ranking), one or more inflation parameters of one or more of the inflatable bladders 13a, 13b, 13c is/are set 80

based on the comparison of the received pressure signals P_d, P_i, P_p. As described herein, the one or more inflation parameters include parameters associated with the valves 25a, 25b, 25c and/or one or more parameters associated with the pressurized fluid source 21. Thus, for example, setting 80 the one or more inflation parameters of the one or more inflatable bladders 13a, 13b, 13c can include adjusting the open time of one or more of the valves 25a, 25b, 25c and/or to adjust the flow rate of fluid from the pressurized fluid source 21 (e.g., by adjusting a pump speed of a variable speed pump) for a given bladder 13a, 13b, 13c for the therapeutic compression cycle subsequent to the test inflation cycle.

[0052] An example of setting 80 the one or more inflation parameters of the inflatable bladders 13a, 13b, 13c is shown in FIG. 5A. In general, the received pressure signals P_d, P_i, P_p corresponding to the test inflation pressures in the respective inflatable bladders during the test inflation cycle serve as proxies for the actual pressures in the inflatable bladders 13a, 13b, 13c during the therapeutic compression cycle. Accordingly, as described in further detail below, the received pressure signals P_d, P_i, P_p corresponding to the test inflation pressures serve as the basis for setting one or more inflation parameters of at least one of the inflatable bladders 13a, 13b, 13c to achieve an appropriate compression gradient in the compression garment 10 during therapeutic compression cycles following the test inflation cycle.

[0053] If the received pressure signal P_i for the intermediate inflatable bladder 13b is higher than the received pressure signal P_d for the distal inflatable bladder 13a, the one or more processors 7 can execute instructions to control the valves 25a, 25b, 25c (e.g., by changing one or more valve positions) and/or the pressurized fluid source 21 (e.g., by controlling a speed of a variable speed pump) to increase the inflation time for the distal inflatable bladder 13a, decrease the inflation time for the intermediate inflatable bladder 13b, increase the rate of inflation for the distal inflatable bladder 13a, and/or decrease the rate of inflation for the intermediate inflatable bladder 13b during a subsequent therapeutic compression cycle to achieve a pressure gradient in which $P_d > P_i > P_p$.

[0054] If the received pressure signal P_p for the proximal inflatable bladder 13c is higher than the received pressure signal P_i for the intermediate inflatable bladder 13b, the one or more processors 7 can execute instructions to control the valves 25a, 25b, 25c and/or the pressurized fluid source 21 to increase the inflation time for the intermediate inflatable bladder 13b, decrease the inflation time for the proximal inflatable bladder 13c, increase the rate of

inflation for the intermediate inflatable bladder 13b, and/or decrease the rate of inflation for the proximal inflatable bladder 13c during a subsequent therapeutic compression cycle to achieve a pressure gradient in which $P_d > P_i > P_p$.

[0055] If the received pressure signal P_p for the proximal inflatable bladder 13c is higher than the received pressure signal P_d for the distal inflatable bladder 13a, the one or more processors 7 can execute instructions to control the valves 25a, 25b, 25c and/or the pressurized fluid source 21 to increase the inflation time for the distal inflatable bladder 13a, decrease the inflation time for the proximal inflatable bladder 13c, increase the rate of inflation for the distal inflatable bladder 13a, and/or decrease the rate of inflation for the proximal inflatable bladder 13c during a subsequent therapeutic compression cycle to achieve a pressure gradient in which $P_d > P_i > P_p$.

[0056] Based at least in part on the set 80 one or more inflation parameters, the inflatable bladders 13a, 13b, 13c are each inflated 90 to a second pressure greater than the corresponding test inflation pressure of each inflatable bladder 13a, 13b, 13c. The second pressure of each inflatable bladder 13a, 13b, 13c can, for example, be a therapeutic compression pressure greater than about 22 mmHg. With the one or more inflation parameters set 80, the inflation 90 of the inflatable bladders 13a, 13b, 13c to the second pressure greater than the corresponding test inflation pressure can result in appropriate pressure gradient applied by the compression garment 10 to the limb of the wearer.

[0057] While certain embodiments have been described, other embodiments are additionally or alternatively possible.

[0058] For example, while controlling 40 the test inflation cycle of fluid flow from the pressurized fluid source to each inflatable bladder 13a, 13b, 13c has been described as being initiated at a regular interval, other intervals for initiating control 40 of the test inflation cycle are additionally or alternatively possible. For example, initiation of the control 40 of the test inflation cycle can occur more frequently following a change in the one or more inflation parameters of the one or more inflatable bladders 13a, 13b, 13c. A change in the one or more inflation parameters can indicate a change in the position of the limb and/or a change in the position of the garment 10 with respect to the limb. Thus, a change in the one or more inflation parameters of the inflatable bladders 13a, 13b, 13c can be indicative of a transient condition through which the pressure gradient of the compression garment 10 should be more closely

monitored. The interval between initiating control 40 of the test inflation cycle can be gradually increased with each determination 70 that the one or more inflation parameters of the inflatable bladders 13a, 13b, 13c should remain unchanged.

[0059] Additionally, or alternatively, controlling 40 the test inflation cycle can be initiated in response to a change in a measured vascular refill time associated with the compression garment 10. Changes in vascular refill time can indicate a change in the position of the garment and/or in the wearer's physiology. Thus, a change in vascular refill time can serve as a useful trigger to initiate control 40 of the test inflation cycle. Additionally, or alternatively, controlling 40 the test inflation cycle can be initiated in response to patient activity. For example, sensors can detect movement of the compression garment 10 initiate control 40 of the test inflation cycle upon sensing a threshold level of movement. Among other things, movement of the compression garment 10 can cause the effective volume of one or more of the inflatable bladders 13a, 13b, 13c to change, possibly causing a deviation from a desired pressure gradient to be applied across the compression garment 10. Thus, checking the pressure gradient upon detecting a threshold level of movement of the compression garment 10 can facilitate timely recalibration of the compression gradient of the compression garment 10 in response to a change in conditions. As another example, while comparing 60 the received pressure signals to one or more reference pressure values has been described as including comparing 60 the received pressure signals P_d, P_i, P_p to one another, other standards of comparison are additionally or alternatively within the scope of the present disclosure.

[0060] For example, referring now to FIGS. 1-4 and 5B, the received pressure signals P_d, P_i, P_p can be compared 60 to predetermined test inflation pressures P_{dp}, P_{ip}, P_{pp} stored in the computer readable storage medium 33 and indicative of a desired pressure in the respective inflatable bladders 13a, 13b, 13c during the test inflation cycle. The predetermined test inflation pressure P_{dp} in the distal inflatable bladder 13a can be greater than a predetermined test inflation pressure P_{ip} in the intermediate inflatable bladder 13b, and the predetermined test inflation pressure P_{ip} in the intermediate inflatable bladder 13b can be greater than a predetermined test inflation pressure P_{pp} in the proximal inflatable bladder 13c. Thus, setting 80 the one or more inflation parameters of the inflatable bladders 13a, 13b, 13c such that the pressure signals P_d, P_i, P_p equal the respective predetermined test inflation pressures P_{dp}, P_{ip}, P_{pp} results in a pressure gradient in which $P_d > P_i > P_p$ during a subsequent therapeutic compression cycle. The setting 80

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of the one or more inflation parameters of the inflatable bladders 13a, 13b, 13c is similar to the adjustment described above.

[0061] While single values of predetermined test inflation pressures P_{dp}, P_{ip}, P_{pp} have been described, the predetermined test inflation pressures P_{dp}, P_{ip}, P_{pp} can additionally or alternatively include a respective predetermined pressure range and/or a respective predetermined pressure ratio based on expected test inflation pressures, given the test inflation time and the test inflation rate for a given inflatable bladder 13a, 13b, 13c. As compared to embodiments in which the comparison 60 of the pressure signals P_d, P_i, P_p is made to single values of the predetermined test inflation pressures P_{dp}, P_{ip}, P_{pp}, the use of ranges and/or ratios of predetermined test inflation pressures P_{dp}, P_{ip}, P_{dp} can, for example, reduce the number of adjustments needed to the inflation parameters while allowing adjustments in response to conditions likely to impact the therapeutic compression cycle of the compression garment 10.

[0062] Additionally, or alternatively, the predetermined test inflation pressures P_{dp}, P_{ip}, P_{pp} can be the previously measured test inflation pressures (e.g., measured during the previous test inflation cycle) for the respective inflatable bladder 13a, 13b, 13c. Basing the predetermined test inflation pressures P_{dp}, P_{ip}, P_{pp} on previously measured test inflation pressure pressures can facilitate, for example, maintaining a customized pressure gradient in the inflatable bladders 13a, 13b, 13c.

[0063] It should be appreciated that, in certain embodiments, the computer readable storage medium 33 can include instructions to cause the one or more processors 7 to recognize the compression garment 10 connected to the controller 5 and access predetermined test inflation pressures P_{dp}, P_{ip}, P_{pp} stored in the computer readable storage medium 33 associated with the recognized compression garment 10.

[0064] As yet another example, while the pressure signals P_d, P_i, P_p have each been described as being a respective single pressure measurement during a test inflation cycle of a respective inflatable bladder 13a, 13b, 13c, other methods of determining pressure in the inflatable bladders 13a, 13b, 13c during the respective test inflation cycles are additionally or alternatively possible. For example, controlling 40 the test inflation cycle of each inflatable bladder 13a, 13b, 13c can include inflating each of the inflatable bladders 13a, 13b, 13c multiple times and receiving 50 the plurality of pressure signals P_d, P_i, P_p from the pressure sensor 27 includes averaging the respective pressure signals P_d, P_i, P_p for the multiple test inflation cycles

of each respective inflatable bladder 13_a, 13_b, 13_c. Averaging the test inflation pressures P_d, P_i, P_p can reduce the likelihood that setting 80 one or more inflation parameters of at least one of the inflatable bladders 13a, 13b, 13c would be based on a spurious measurement.

[0065] As still another example, while compression systems have been described as being used with thigh length compression sleeves, it should be understood that the compression systems can additionally or alternatively be used with other types of compression garments. For example, the compression systems can be used with knee-length compression sleeves and/or with sleeves having a different number of bladders configured to be disposed over different areas of the wearer's body.

[0066] Embodiments can be implemented in digital electronic circuitry, or in computer hardware, firmware, software, or in combinations thereof. The controller of the compression system can be implemented in a computer program product tangibly embodied or stored in a machine-readable storage device for execution by a programmable processor; and method actions can be performed by a programmable processor executing a program of instructions to perform functions of the controller of the compression system by operating on input data and generating output. The controller of the compression system can be implemented in one or more computer programs that are executable on a programmable system including at least one programmable processor coupled to receive data and instructions from, and to transmit data and instructions to, a data storage system, at least one input device, and at least one output device. Each computer program can be implemented in a high-level procedural or object oriented programming language, or in assembly or machine language if desired; and in any case, the language can be a compiled or interpreted language.

[0067] Suitable processors include, by way of example, both general and special purpose microprocessors. Generally, a processor will receive instructions and data from a read-only memory and/or a random access memory. Generally, a computer will include one or more mass storage devices for storing data files; such devices include magnetic disks, such as internal hard disks and removable disks; magneto-optical disks; and optical disks. Storage devices suitable for tangibly embodying computer program instructions and data include all forms of non-volatile memory, including by way of example semiconductor memory devices, such as EPROM, EEPROM, and flash memory devices; magnetic disks such as internal hard disks and removable disks; magneto-optical disks; and CD_ROM disks. Any of the foregoing can be

supplemented by, or incorporated in, ASICs (application-specific integrated circuits) or FPGAs (field programmable logic arrays).

[0068] A number of embodiments have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the disclosure. For example, while a controller with a single pressure sensor has been described, additional pressure sensors (e.g., one for each inflatable bladder) can also be used without departing from the scope of the present disclosure. Accordingly, other embodiments are within the scope of the following claims.

[0069] In the claims which follow and in the preceding description of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprise" or variations such as "comprises" or "comprising" is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the invention.

WHAT IS CLAIMED IS:

1. A compression device controller comprising:

one or more processors;

computer executable instructions embodied on a computer readable storage medium, the computer executable instructions including instructions for causing the one or more processors to:

control a non-therapeutic test inflation cycle of fluid flow from a fluid source to each inflatable bladder of a plurality of inflatable bladders of a compression garment;

receive a plurality of pressure signals from at least one pressure sensor, each pressure signal indicative of a corresponding non-therapeutic test inflation pressure in the respective inflatable bladder during the non-therapeutic test inflation cycle;

vent each inflatable bladder to reduce the pressure in the inflatable bladder to atmospheric pressure or to a residual pressure prior to inflation of another inflatable bladder such that the test inflation cycles of each of the inflatable bladders do not overlap;

compare the received pressure signals to one or more reference pressure values;

based at least in part on the comparison of the pressure signals to one or more reference pressure values, set one or more inflation parameters of at least one of the plurality of inflatable bladders for a therapeutic compression treatment; and

based at least in part on the set one or more therapeutic inflation parameters, inflate the inflatable bladders to a respective second inflation pressure greater than the corresponding non-therapeutic test inflation pressure of each inflatable bladder to impart the therapeutic compression treatment.

2. The compression device controller of claim 1, wherein the instructions to receive a plurality of pressure signals include instructions to rank the corresponding inflatable bladders relative to one another and the instructions to set one or more therapeutic inflation parameters includes instructions to adjust the one or more therapeutic inflation parameters based at least in part on the rank of the corresponding inflatable bladders relative to one another.

3. The compression device controller of claim 2, wherein the instructions to set the one or more therapeutic inflation parameters include instructions to adjust the one or more therapeutic inflation parameters if the relative ranking of the plurality of inflatable bladders does not match a set ranking of the inflatable bladders.

4. The compression device controller of claim 1, wherein the instructions to set the one or more therapeutic inflation parameters include instructions to set the one or more therapeutic inflation parameters based on a predetermined pressure gradient of the respective second pressures of the plurality of inflatable bladders.

5. The compression device controller of claim 1, wherein the instructions to compare the received plurality of pressure signals to one or more reference pressure values include instructions to compare the received plurality of pressure signals to each other.

6. The compression device controller of claim 1, wherein the instructions to compare the received pressure signals to one or more reference pressure values include instructions to compare the received plurality of pressure signals to predetermined pressure values.

7. The compression device controller of claim 1, wherein the instructions to compare the received plurality of pressure signals to one or more reference pressure values include instructions to compare an average of a plurality of pressure signals of a respective inflatable bladder to one or more reference pressure values.

8. The compression device controller of any one of the preceding claims, wherein the non-therapeutic test inflation pressure of each inflatable bladder is less than about 20 mmHg and the second inflation pressure of each inflatable bladder is greater than about 25 mmHg.

9. The compression device controller of claim 1, wherein the instructions to control the non-therapeutic test inflation cycle of fluid flow to each inflatable bladder include instructions to control one or more of a test inflation time and a test inflation flow rate to each respective inflatable bladder.

10. The compression device controller of claim 1, wherein the instructions to control the non-therapeutic test inflation cycle of fluid flow to each inflatable bladder include instructions to initiate the non-therapeutic test inflation cycle to each bladder at a specified interval.

11. The compression device controller of any one of the preceding claims, wherein the computer readable storage medium further comprises instructions for causing the one or more processors to determine a vascular refill time associated with a limb of a subject, wherein the instructions to control the non-therapeutic test inflation cycle of fluid flow to each inflatable bladder are initiated based at least in part on a change in the vascular refill time associated with the limb of the subject.

12. The compression device controller of claim 1, wherein the instructions to control the non-therapeutic test inflation cycle of fluid flow to each inflatable bladder include instructions to inflate and deflate one inflatable bladder at a time.

13. The compression device controller of claim 1, wherein the instructions to control the non-therapeutic test inflation cycle of fluid flow to each inflatable bladder include instructions to inflate and deflate each inflatable bladder in sequence, one after another.

14. The compression device controller of any one of the preceding claims, wherein each pressure signal is received generally at an end of the non-therapeutic test inflation cycle of the respective inflatable bladder.

15. A compression system comprising:

a compression garment including inflatable bladders;

valves actuatable to control fluid flow from a fluid source to the inflatable bladders;

at least one pressure sensor positionable, through actuation of the valves, in pneumatic communication with each inflatable bladder; and

a controller in electrical communication with the at least one pressure sensor and the valves, the controller comprising one or more processors, a computer readable storage medium, and computer executable instructions embodied on the computer readable storage medium, the computer executable instructions including instructions for causing the one or more processors to:

control a non-therapeutic test inflation cycle of fluid flow from the fluid source to each inflatable bladder;

receive a plurality of pressure signals from the at least one pressure sensor, each pressure signal indicative of the corresponding non-therapeutic test inflation pressure in the respective inflatable bladder;

vent each inflatable bladder to reduce the pressure in the inflatable bladder to atmospheric pressure or to a residual pressure prior to inflation of another inflatable bladder such that the test inflation cycles of each of the inflatable bladders do not overlap;

compare the received pressure signals to one or more reference pressure values;

based at least in part on the comparison of the plurality of pressure signals to the one or more reference pressure values, set one or more therapeutic inflation parameters of at least one of the inflatable bladders for a therapeutic compression treatment; and

based at least in part on the set one or more therapeutic inflation parameters, inflate the inflatable bladders to a respective second inflation pressure greater than the corresponding non-therapeutic test pressure of each bladder to impart the therapeutic compression treatment.

16. A computer-implemented method of controlling inflation of a compression garment, the computer-implemented method comprising:

controlling a non-therapeutic test inflation cycle of fluid flow from a fluid source to each inflatable bladder of a plurality of inflatable bladders;

receiving a plurality of pressure signals from at least one pressure sensor, each pressure signal indicative of the corresponding non-therapeutic test inflation pressure in the respective inflatable bladder;

venting each inflatable bladder to reduce the pressure in the inflatable bladder to atmospheric pressure or to a residual pressure prior to inflation of another inflatable bladder such that the test inflation cycles of each of the inflatable bladders do not overlap;

comparing the received plurality of pressure signals to one or more reference pressure values;

based at least in part on the comparison of the plurality of pressure signals to the one or more reference pressure values, setting one or more therapeutic inflation parameters of at least one of the inflatable bladders for a therapeutic compression treatment; and

based at least in part on the set one or more therapeutic inflation parameters, inflating the inflatable bladders to a respective second inflation pressure greater than the corresponding non-therapeutic test pressure of each bladder to impart the therapeutic compression treatment.

17. The computer-implemented method of claim 16, wherein comparing the received plurality of pressure signals to one or more reference pressure values includes comparing the received plurality of pressure signals to each other.

18. The computer-implemented method of claim 16 or 17, wherein comparing the received plurality of pressure signals to one or more reference pressure values includes comparing the received plurality of pressure signals to predetermined pressure values.

19. The computer-implemented method of claim 16, wherein comparing the received plurality of pressure signals to one or more reference pressure values includes ranking the corresponding inflatable bladders relative to one another and setting the one or more inflation parameters includes adjusting the one or more inflation parameters based at least in part on the rank of the corresponding inflatable bladders relative to one another.

20. The computer-implemented method of any one of claims 16 to 19, wherein the non-therapeutic test inflation pressure of each inflatable bladder is less than about 20 mmHg and the second inflation pressure of each inflatable bladder is greater than about 25 mmHg.

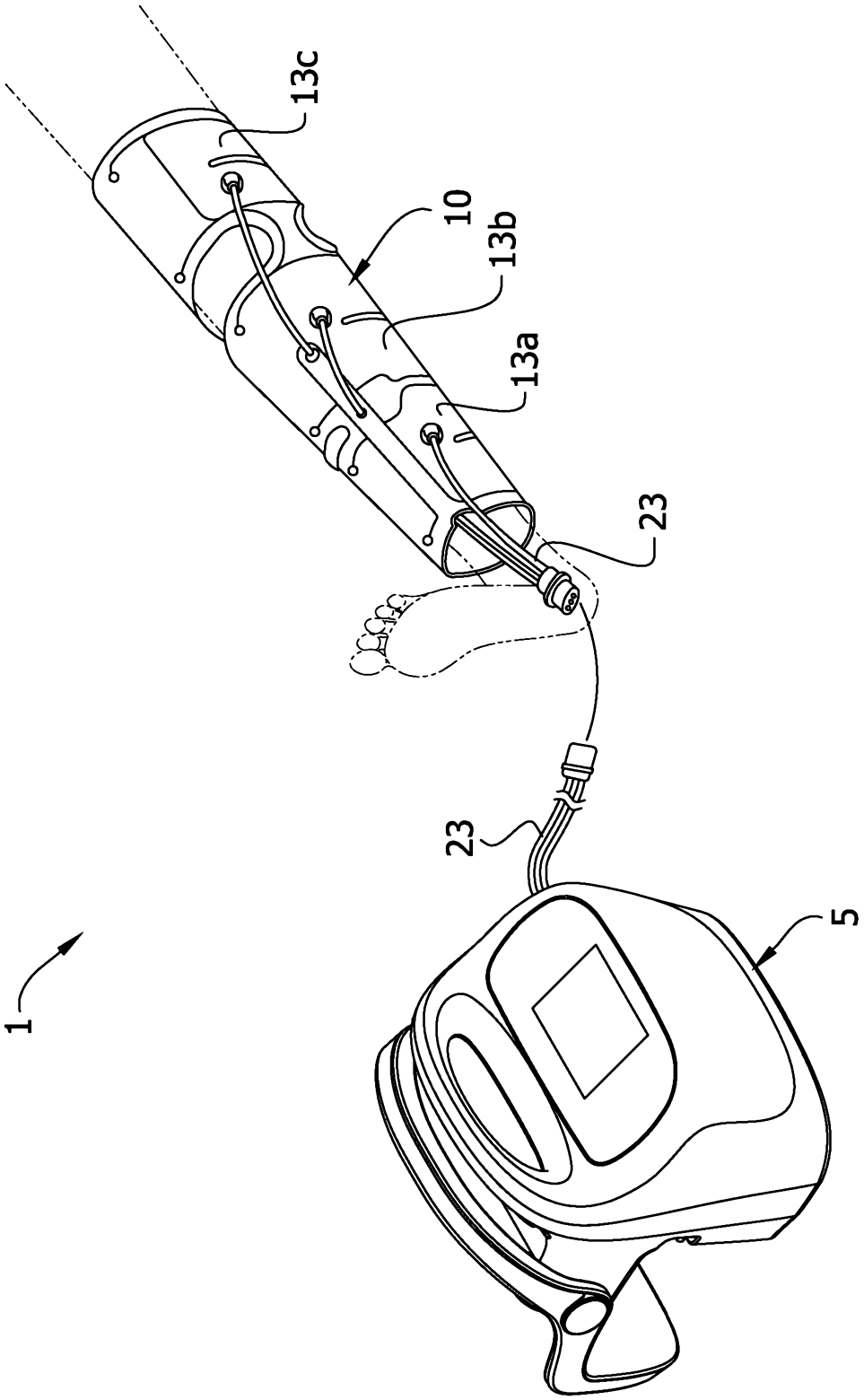

FIG. 1

FIG. 2

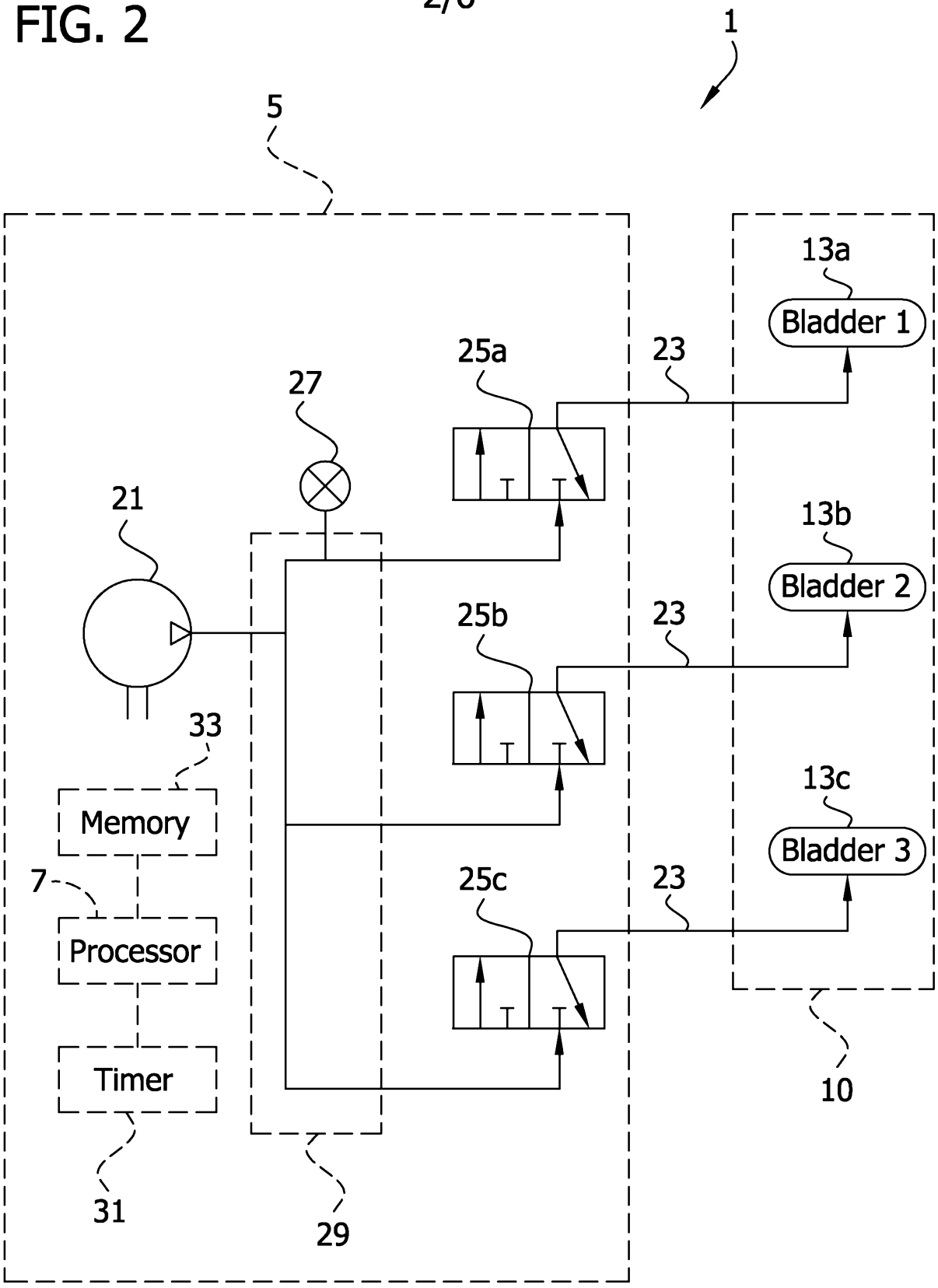
1
5
13a
Bladder 1
25a
23
27
21
13b
Bladder 2
25b
23
33
13c
Bladder 3
Memory
7
25c
23
Processor
Timer
10
31
29

FIG. 3

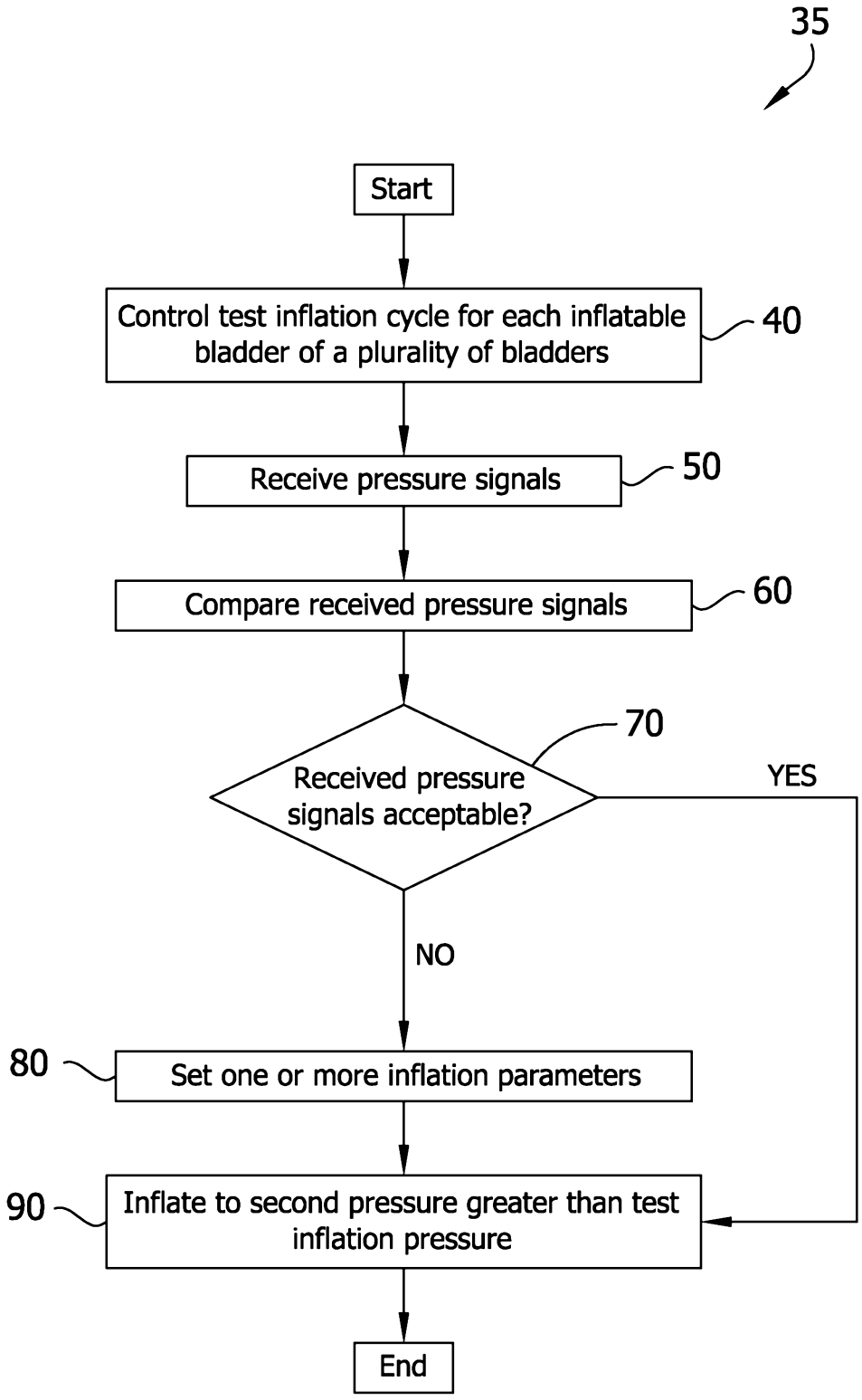
35
Start
Control test inflation cycle for each inflatable bladder of a plurality of bladders
40
Receive pressure signals
50
Compare received pressure signals
60
Received pressure signals acceptable?
70
YES
NO
80
Set one or more inflation parameters
90
Inflate to second pressure greater than test inflation pressure
End

FIG. 4

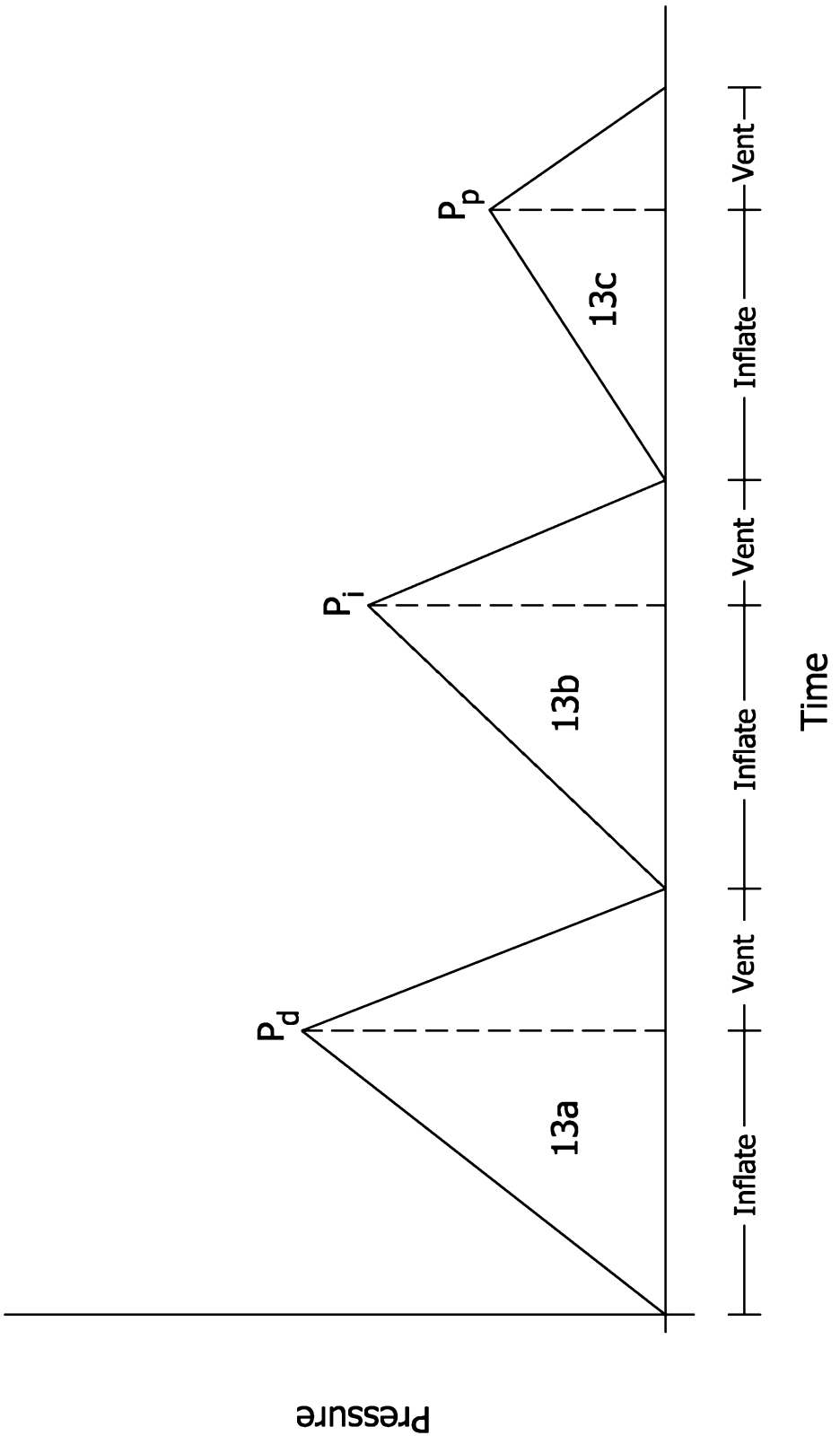
Pressure
Time
P_d
P_i
P_p
13a
13b
13c
Inflate
Vent
Inflate
Vent
Inflate
Vent

FIG. 5A

Pressure Comparison	Inflation Parameter Action
$P_d > P_i$	No Change
$P_i > P_p$	No Change
$P_d > P_p$	No Change
$P_i > P_d$	Increase Inflation Time/Rate of Distal Bladder and/or Decrease Inflation Time/Rate of Intermediate Bladder
$P_p > P_i$	Increase Inflation Time/Rate of Intermediate Bladder and/or Decrease Inflation Time/Rate of Proximal Bladder
$P_p > P_d$	Increase Inflation Time/Rate of Distal Bladder and/or Decrease Inflation Time/Rate of Proximal Bladder

FIG. 5B

Pressure Comparison	Inflation Parameter Action
$P_d = P_{dp}$	No Change
$P_i = P_{ip}$	No Change
$P_i = P_{ip}$	No Change
$P_d > P_{dp}$	Decrease Inflation Time and/or Decrease Inflation Rate of Distal Bladder
$P_i > P_{ip}$	Decrease Inflation Time and/or Decrease Inflation Rate of Intermediate Bladder
$P_p > P_{pp}$	Decrease Inflation Time and/or Decrease Inflation Rate of Proximal Bladder
$P_d < P_{dp}$	Increase Inflation Time and/or Increase Inflation Rate of Distal Bladder
$P_i < P_{ip}$	Increase Inflation Time and/or Increase Inflation Rate of Intermediate Bladder
$P_p < P_{pp}$	Increase Inflation Time and/or Increase Inflation Rate of Proximal Bladder