TITLE OF THE INVENTION

REDUCED-PRESSURE TREATMENT SYSTEMS AND METHODS EMPLOYING A VARIABLE COVER

RELATED APPLICATION

[0001] The present invention claims the benefit, under 35 USC § 119(e), of the filing of U.S. Provisional Patent Application serial number 61/169,104, entitled "Reduced-Pressure Treatment Systems and Methods Employing A Variable Cover," filed April 14, 2009, which is incorporated herein by reference for all purposes.

BACKGROUND

[0002] Clinical studies and practice have shown that providing a reduced pressure in proximity to a tissue site augments and accelerates the growth of new tissue at the tissue site. The applications of this phenomenon are numerous, but application of reduced pressure has been particularly successful in treating wounds. This treatment (frequently referred to in the medical community as "negative pressure wound therapy," "reduced pressure therapy," or "vacuum therapy") provides a number of benefits, which may include faster healing and increased formulation of granulation tissue. Unless otherwise indicated, as used herein, "or" does not require mutual exclusivity.

SUMMARY

[0003] The reduced-pressure treatment systems and methods herein address shortcomings of prior treatment systems and methods. According to an illustrative embodiment, a system for providing reduced-pressure treatment to a tissue site on a wound bed of a patient includes a variable wound dressing having a variable cover that is pliable at ambient pressure and less pliable when placed under reduced pressure. The variable wound dressing has a first side and a second, patient-facing side, and a treatment space is formed between the second, patient-facing side of the variable dressing and the wound bed. A first reduced-pressure port is in fluid communication with the variable cover and operable to supply reduced pressure within the variable cover. Also, a second reduced-pressure port is in fluid communication with the treatment space. A reduced-pressure subsystem is also included that is operable to supply reduced pressure to the first reduced-pressure port and the second reduced-pressure port.

[0004] According to another illustrative embodiment, a method for providing reduced pressure treatment to a tissue site on a wound bed of a patient is provided. The method includes the step of providing a variable wound dressing having an interior space. The variable wound dressing has a pliable state and a less-pliable state and is operable to change from the pliable state to the less-pliable state in the presence of an activating reduced pressure. The method also includes the step of disposing the variable wound dressing over the wound, whereby a treatment space is formed between the wound and the variable wound dressing. The method also includes the steps of forming a fluid seal over the wound, providing an activating reduced pressure to the interior space of the variable wound dressing, and providing a treatment reduced pressure to the treatment space.

[0005] According to another illustrative embodiment, a method of manufacturing a variable wound dressing for use as part of a reduced-pressure wound treatment system is provided. The method includes the step of providing an envelope having an interior space and having a first side and a second, patient-facing side. The method also includes disposing a plurality of spacing members within the interior space, and sealing the interior space. In addition, the method may include forming a first reduced-pressure aperture on the envelope for providing fluid communication to the interior space and forming a second reduced-pressure aperture through the envelope for providing fluid communication from the first side of the envelope to the second side of the envelope.

[0006] Other objects, features, and advantages of the illustrative embodiments will become apparent with reference to the drawings and detailed description that follow.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIGURE 1 is a schematic, cross-sectional view, with a portion shown as a block diagram, of a reduced-pressure treatment system according to one illustrative embodiment;

[0008] FIGURE 2A is a schematic, plan view of an illustrative embodiment of a reduced-pressure treatment system;

[0009] FIGURE 2B is a schematic, cross-sectional view taken along line 2B-2B in FIGURE 2A; and

[0010] FIGURE 3 is a schematic, cross-sectional view of a portion of a reduced-pressure treatment system according to another illustrative embodiment.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0011] In the following detailed description of the illustrative embodiments, reference is made to the accompanying drawings that form a part hereof. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it is understood that other embodiments may be utilized and that logical structural, mechanical, electrical, and chemical changes may be made without departing from the spirit or scope of the invention. To avoid detail not necessary to enable those skilled in the art to practice the embodiments described herein, the description may omit certain information known to those skilled in the art. The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the illustrative embodiments are defined only by the appended claims.

[0012] Referring to FIGURE 1, an illustrative embodiment of a reduced-pressure treatment system 100 for providing reduced-pressure treatment to a tissue site 103, which may include a wound 102, in a wound bed 104 of a patient 106 is presented. The reduced-pressure treatment system 100 includes a variable wound dressing 108, which includes a variable cover 110, an over-drape 112, and a reduced-pressure subsystem 114.

[0013] As used herein, "reduced pressure" generally refers to a pressure less than the ambient pressure at a tissue site that is being subjected to treatment. In most cases, this reduced pressure will be less than the atmospheric pressure at which the patient is located. Alternatively, the reduced pressure may be less than a hydrostatic pressure at the tissue site. In one embodiment, the reduced pressure may initially generate fluid flow in a first reduced-pressure delivery conduit 164. Unless otherwise indicated, values of pressure stated herein are

gauge pressures. The reduced pressure delivered may be constant or variable (patterned or random) and may be delivered continuously or intermittently. Although the terms "vacuum" and "negative pressure" may be used to describe the pressure applied to the tissue site 103, the actual pressure applied to the tissue site 103 may be more than the pressure normally associated with a complete vacuum. Consistent with the use herein, an increase in reduced pressure or vacuum pressure typically refers to a relative reduction in absolute pressure.

[0014] The wound 102 may be any type of wound, or damaged area of tissue, and may include wounds from trauma, surgery, or other causes, such as a diabetic ulcer. The tissue site 103, which includes the wound 102, may be the bodily tissue of any human, animal, or other organism, including bone tissue, adipose tissue, muscle tissue, dermal tissue, vascular tissue, connective tissue, cartilage, tendons, ligaments, or any other tissue. Treatment of the tissue site 103 may include removal of fluids, e.g., ascites or exudates, protection of the abdominal cavity, or delivery of reduced pressure.

[0015] The variable wound dressing 108, or treatment device, includes the variable cover 110. The variable cover 110 is formed with a sealed envelope 116 that has a first side 118 and a second, patient-facing side 120. The variable wound dressing 108 may further include a support member 122, which has a first side 124 and a second, patient-facing side 126. The support member 122 may be a separate item or may be coupled to the second, patient-facing side 120 of the variable cover 110 or formed integrally with the second, patient-facing side 120 of the variable cover 110. As will be explained further below, the support member 122 provides initial support for the variable cover 110.

[0016] The sealed envelope 116 is formed by a first wall 130, which may be a first sheet, and a second wall 132, which may be a second sheet. The first wall 130 and second wall 132 may be coupled, such as by a weld 134, on a peripheral edge 136. The coupling of walls 130 and 132 may be accomplished using any known technique, including welding (e.g., ultra sonic or RF welding), bonding, adhesives, cements, etc. An interior space 138 within the sealed envelope 116 is formed between the first wall 130 and the second wall 132. A plurality of spacing members 140 is disposed within the interior space 138. The first wall 130 and the second wall 132 may be formed of a non-breathable material, such as a non-breathable nylon material or a resilient polymer film. The material from which the first wall 130 and second wall 132 are formed may further have the characteristic of being substantially non-stretchable. In an alternative embodiment (not shown), partitioning members may be placed within the interior space 138 to hold a portion of the spacing members 140 in a designated zone within the interior space 138.

[0017] The spacing members 140 are formed from a material such that when the spacing members 140 are subjected to reduced pressure within the variable cover 110, the variable cover 110 becomes less pliable, or more rigid. The increase in rigidity, or decrease in pliability, may occur because contact forces between adjacent spacing members 140 increases under reduced pressure and thereby causes an increase in frictional forces that oppose relative movement of the spacing members 140. The friction between the spacing members 140 makes the variable cover 110 become less pliable, or more rigid. Alternatively, the increased forces between spacing members 140 may cause a mechanical lock in some embodiments.

[0018] The spacing members 140 may include, for example, polystyrene members, including polystyrene balls, that may be encased in a laminated nylon and vinyl material, styrofoam beads, low-density polymer beads, solid granules of plastic, etc. The spacing members 140 may take any shape, but round members may allow easier relative movement while the variable wound dressing 108 is being shaped or while the variable wound dressing 108 is in a pliable state.

[0019] When reduced pressure is applied to the interior space 138 of the variable cover 110, the variable cover 110 becomes less pliable (more rigid), as the spacing members 140 press against one another. In the less-pliable state (or more rigid state), the variable cover 110 preferably will not substantially deform as treatment reduced pressure is supplied to a treatment space 158. The interior space 138 of the variable cover 110 has a first volume (V_1) at a first reduced pressure (P_1) and a second volume (V_2) at a second reduced pressure (P_2), where P_1 and P_2 are less than atmospheric or ambient pressure and $P_1 > P_2$ on an absolute pressure scale and $V_1 > V_2$. Assuming that P_2 is low enough to cause the spacing members 140 to impinge against one another, the variable cover 110 becomes less pliable at the second reduced pressure (P_2) than at the first reduced pressure (P_1).

[0020] The support member 122 may be formed from a thin (e.g., 0.25 mm to 2 mm), high-density polyethylene sheet, but numerous other materials might be used, such as a closed-cell foam. The support member 122 provides support between wound margins 142 and 144 of the variable cover 110, including while the variable cover 110 is being put into place in the pliable state. The support member 122 may prevent the variable cover 110 from sagging excessively while the variable cover 110 is in the pliable state. For example, in one embodiment, the support member 122 may prevent the variable cover 110 from extending below the plane containing wound margins 142 and 144. Thus, the support member 122 preferably has enough structural support to hold the variable cover 110 without deforming below the plane that contains wound margins 142 and 144. The support member 122 is

preferably formed from a non-adherent material to provide for the situation in which tissue may be pressed against the support member 122. The support member 122 may have substances applied to the second, patient-facing side 126, such as honey, silver, various anti-microbials, etc.

[0021] The substances placed on the second, patient-facing side 126 of support member 122 may help to fight infection, provide other health benefits, or facilitate movement of tissue as the tissue grows while disposed against the second, patient-facing side 126 of the support member 122. A sealing material, e.g., a hydrocolloid, may be added to the second, patient-facing side 126 of the support member 122 to facilitate formation of a fluid seal with the patient's epidermis 107. If a closed-cell foam is used as the support member 122, the closed-cell foam may be impregnated with the substances and may provide for a timed release of the substances. In an alternative embodiment (not explicitly shown) in which the support member 122 is omitted, the substances or substances may be added to second, patient-facing side of the second wall 132.

[0022] Reduced pressure is provided to the interior space 138 of the variable cover 110 and to the wound 102. As to the former, a first reduced-pressure aperture 148 is formed on the first side 118 of the variable cover 110, and a first reduced-pressure port 150 is sized and configured to cooperate with the first reduced-pressure aperture 148 to provide reduced pressure to the interior space 138. A second reduced-pressure aperture 152 may be formed through the sealed envelope 116 and particularly through the first wall 130 and the second wall 132. The second reduced-pressure aperture 152 allows a second reduced-pressure port 156 to fluidly communicate with the treatment space 158 that is between the wound bed 104 and the variable wound dressing 108. The second reduced-pressure port 156 may have a first portion 160 and a second portion 162. The first portion 160 fluidly couples the first reduced-pressure delivery conduit 164 to the second reduced-pressure port 156. The second portion 162 may have a wicking member 166 associated with the second portion 162.

[0023] The wicking member 166 may be coupled to the second portion 162, such as by bonding or may be held relative to the second portion 162 or by other techniques, such as by an interference fit or fasteners. The wicking member 166 may be any material that facilitates a migration of exudate or other liquids from the tissue site 103 or wound bed 104 to the second reduced-pressure port 156. As one illustrative example, the wicking member 166 may be a reticulated foam member, such as a GranuFoam® material manufactured by Kinetic Concepts, Incorporated of San Antonio, Texas. The wicking member 166 may extend the full vertical (for the orientation shown in FIGURE 1) distance 170 between the variable wound dressing

108 and the wound bed 104, or a portion thereof as shown. The wicking member 166 may also extend laterally in varying degrees.

[0024] The over-drape 112 may be used over the wound 102 to help form a fluid seal. The over-drape 112 includes a first side 174 and a second, patient-facing side 176. The second, patient-facing side 176 may include an attachment device 178 for attaching the over-drape 112 to a portion of intact epidermis of the patient 106. The attachment device 178 may be used to hold the over-drape 112 against the patient's 106 epidermis or another layer, such as a gasket or additional sealing member. The attachment device 178 may take numerous forms. For example, the attachment device 178 may be a medically acceptable, pressure-sensitive adhesive that extends about a periphery 105 of the over-drape 112. The over-drape 112 may have a central opening 180 or may be a solid sheet with only apertures corresponding to the first reduced-pressure aperture 148 and the second reduced-pressure aperture 152.

[0025] The over-drape 112 may be any material that provides a fluid seal. The over-drape 112 may, for example, be an impermeable or semi-permeable, elastomeric material that has pore sizes less than about 20 microns. "Elastomeric" means having the properties of an elastomer. It generally refers to a polymeric material that has rubber-like properties. More specifically, most elastomers have ultimate elongations greater than 100% and a significant amount of resilience. The resilience of a material refers to the material's ability to recover from an elastic deformation. Examples of elastomers may include, but are not limited to, natural rubbers, polyisoprene, styrene butadiene rubber, chloroprene rubber, polybutadiene, nitrile rubber, butyl rubber, ethylene propylene rubber, ethylene propylene diene monomer, chlorosulfonated polyethylene, polysulfide rubber, polyurethane, EVA film, co-polyester, and silicones. Other specific examples of sealing member materials include a silicone drape, 3M Tegaderm® drape, acrylic drape, such as one available from Avery Dennison, or an incise drape.

[0026] The reduced-pressure subsystem 114 provides an activation reduced pressure to the first reduced-pressure port 150 and a treatment reduced pressure to the second reduced-pressure port 156. The first reduced-pressure delivery conduit 164 is fluidly coupled to the second reduced-pressure port 156 and delivers treatment reduced pressure thereto. A medial portion 182 of the first reduced-pressure delivery conduit 164 may include a representative device 184, which may be one or more devices to accomplish different tasks. For example, the device 184 may be a supplemental fluid reservoir or collection member to hold exudates and other fluids removed. Other examples of device 184 that may be included on the medial portion 182 of the first reduced-pressure delivery conduit 164 or otherwise fluidly coupled to

the first reduced-pressure delivery conduit 164 include the following non-limiting examples: a pressure-feedback device, a volume detection system, a blood detection system, an infection detection system, a flow monitoring system, a temperature monitoring system, etc. Some of these devices may be formed integrally to a reduced-pressure source 192. For example, a reduced-pressure port 193 on the reduced-pressure source 192 may include a filter member that includes one or more filters, e.g., an odor filter.

[0027] A canister 186, or reservoir, is fluidly coupled to the first reduced-pressure delivery conduit 164 for receiving exudates and other fluids from the wound 102. A second reduced-pressure delivery conduit 188 is fluidly coupled to a valve 190, such as a three-way valve. The reduced-pressure source 192 generates a reduced pressure that is supplied through a third reduced-pressure delivery conduit 194 to the three-way valve 190. The reduced-pressure source 192 provides reduced pressure. The reduced-pressure source 192 may be any means of supplying a reduced pressure, such as a vacuum pump or wall suction source. While the amount and nature of reduced pressure applied to the tissue site 103 or treatment space 158 will typically vary according to the application, the reduced pressure will typically be between -5 mm Hg and -500 mm Hg, and more typically between -100 mm Hg and -250 mm Hg, and more typically still between -100 mm Hg and -200 mm Hg.

[0028] A fourth reduced-pressure delivery conduit 196 is fluidly coupled to the valve 190 and to the first reduced-pressure delivery conduit 164. The valve 190 provides reduced pressure from the reduced-pressure source 192 through the fourth reduced-pressure delivery conduit 196 to the first reduced-pressure port 150 or to the second reduced-pressure delivery conduit 188 and on through the first reduced-pressure delivery conduit 164 to the second reduced-pressure port 156. In an alternative embodiment (not shown), a reduced-pressure source may be associated with the first reduced-pressure port 150 and another reduced-pressure source associated with the second reduced-pressure port 156 without necessitating the need for a valve, such as valve 190. In still another illustrative embodiment, a controller 198 may be provided and coupled to the reduced-pressure source 192 and the valve 190 for controlling the same.

[0029] The activation reduced pressure is supplied by the reduced-pressure subsystem 114 through the fourth reduced-pressure delivery conduit 196 to the first reduced-pressure port 150. The activation reduced pressure is at a level adequate to cause the plurality of spacing members 140 within the interior space 138 to be urged against one another and to thereby cause, in turn, the variable cover 110 to become less pliable. The reduced pressure adequate to establish this effect is the activation reduced pressure and is in the range between -50 mm Hg

and -500 mm Hg and more preferably -100 and -300 mm Hg and more preferably still -100 and -200 mm Hg.

[0030] In operation, the reduced-pressure treatment system 100 is initially applied, depending on the embodiment, by placing the support member 122 over the wound 102 and on a portion of the epidermis 107 to create the treatment space 158. The treatment space 158 is the space between the wound bed 104 and the second, patient-facing side 126 of the support member 122. Then, if not integrally formed with the support member 122, the variable cover 110 is deployed adjacent to the support member 122. Typically, the over-drape 112 is then deployed.

[0031] The over-drape 112 cooperates with or is applied over at least a portion of the variable cover 110 to provide a fluid seal over the tissue site 103. It should be noted that during the application of the variable cover 110, the variable cover 110 is typically in the pliable state and may be readily moved into a desired location by the healthcare provider without the variable cover 110 interfering with the wound 102. If not already installed, the first reduced-pressure port 150 may then be placed into the first reduced-pressure aperture 148. The first reduced-pressure port 150 is coupled to the fourth reduced-pressure delivery conduit 196. If not already installed, the second reduced-pressure port 156 is placed through the second reduced-pressure aperture 152. The s coupled second reduced-pressure port 156 is coupled to the first reduced-pressure delivery conduit 164. If not already associated, the wicking member 166 may be associated with the second portion 162 of the second reduced-pressure port 156. The reduced-pressure subsystem 114 may then be activated to provide reduced-pressure to the reduced-pressure subsystem 114.

[0032] On initial activation, the reduced-pressure source 192 begins to supply reduced pressure which is delivered through the valve 190 to the fourth reduced-pressure delivery conduit 196 and into the interior space 138 such that the reduced pressure, which is the activation reduced pressure, causes the variable cover 110 to become less pliable, i.e., variable cover 110 enters the less-pliable state (or more rigid state). Once the variable cover 110 is in the rigid state, or less-pliable state, the valve 190 is selected to deliver reduced pressure through the second reduced-pressure delivery conduit 188 and on through the first reduced-pressure delivery conduit 164 to the second reduced-pressure port 156 and into the treatment space 158. Alternatively, the valve 190 may provide reduced pressure to the second reduced-pressure delivery conduit 188 at the same time.

[0033] The treatment reduced pressure supplied to the treatment space 158 provides treatment to the tissue site 103 and wound 102 and helps to remove exudates and other fluids.

In some instances, the wound 102 may be placed under the influence of reduced pressure proximate to the second portion 162 of the second reduced-pressure port 156 and in any event will be placed proximate to the wicking member 166. The wicking member 166 helps deliver reduced pressure to the wound and helps to deliver exudate or other fluids into the second reduced-pressure port 156.

[0034] Because the treatment space 158 does not require a manifolding member or other structure when the variable wound dressing 108 is used, the need to change the variable wound dressing 108 may be reduced or eliminated. Moreover, because in the less-pliable state, the variable wound dressing 108 does not develop an inward force on the wound margins 142, 144, growth of tissue at the wound margins 142, 144 may occur without inhibition. The ability of the variable cover 110 to transition between flexible and rigid or semi-rigid states facilitates application and use of the variable wound dressing 108.

[0035] Referring now to FIGURES 2A and 2B, another illustrative embodiment of a reduced-pressure treatment system 200 is presented. The reduced-pressure treatment system 200 is analogous in most respects to the reduced-pressure treatment system 100 of FIGURE 1 and analogous parts have been shown by indexing the reference numerals by 100. Thus, for example, the reduced-pressure treatment system 200 is shown over a tissue site 203, which includes a wound 202, and sealed with an over-drape 212. A first reduced-pressure port 250 is shown extending from a first side 218 of a variable cover 210. A second reduced-pressure port 256 is shown with a wicking member 266. At the same time, there are a number of differences.

[0036] For example, in this illustrative embodiment, the variable cover 210 is formed with an interior space 238 into which a plurality of spacing members 240 is disposed, but in this illustrative embodiment, the spacing members 240 are formed as irregular-shaped members. In this regard, it should be noted that the spacing members 140, 240 may take any shape. In this illustrative embodiment, a support member 222 is coupled to the variable cover 210. The support member 222 may be coupled on a first side 224 to a second, patient-facing side 220 of a sealed envelope 216 of the variable cover 210. Alternatively, as shown, a periphery, e.g., near where weld 234 is located, of the sealed envelope 216 and support member 222 may be coupled. The coupling for either approach may occur using any known technique, such as bonding, welding, adhesives, etc. In FIGURE 2B, the coupling is shown with the weld 234 coupling the support member 222 and a second wall 232 of the sealed envelope 216. The weld 234 in this embodiment also couples a first wall 230 and the second wall 232 to form the sealed envelope 216.

[0037] FIGURE 2B shows that the variable wound dressing 208 may be manipulated into having a dome shape, which may give additional structural support in order to provide and maintain the treatment space 268 under increased reduced pressure. Thus, for example, the distance between the wound bed 204 and the second, patient-facing side 226 of the support member 222 is given by the distance 270, which is greater than the distance would be with a substantially flat configuration, which would correspond with distance 271. For comparison purposes, it should also be noted that without the support member 222, the weight of the variable wound dressing 208 might cause the variable wound dressing 208 to extend below the plane of the wound margins 242 and 244 as suggested by distance 273.

[0038] In the illustrative embodiment of FIGURE 2B, the second reduced-pressure aperture 252 is formed on a web portion 253 of the variable cover 210. The web portion 253 is formed by bringing the first wall 230 into contact or close proximity to the second wall 232 in a given area so as to minimize or eliminate the interior space 238 proximate the second reduced-pressure aperture 252.

[0039] Referring now to FIGURE 3, an alternative embodiment of a portion of a reduced-pressure treatment system 300 is presented. The reduced-pressure treatment system 300 is analogous in most respects to the reduced-pressure treatment system 100 of FIGURE 1, and to indicate generally analogous parts, reference numerals have been indexed by 200. Thus, a variable wound dressing 308 is shown on a portion of epidermis 307 of a patient 306. The variable wound dressing 308 has a variable wound cover 310 that extends across wound margins 342, 344 and covers a tissue site 303. The variable wound cover 310 is positioned over the tissue site 303 and thereby helps define a treatment space 358. An overdrape 312 provides a fluid seal between the variable wound cover 310 and the patient's epidermis 307.

[0040] The variable wound cover 310 is formed with a sealed envelope 316 that defines an interior space 338 containing a plurality of spacing members 340. The sealed envelope 316 may be formed by a first wall 330 and a second wall 322. It should be noted that in this particular embodiment, the second wall 322 serves as both a sealing wall and a support member. In other words, by comparison with FIGURE 1, the second wall 132 has a support member 122 placed adjacent to the second wall 132, but in the embodiment of FIGURE 3, the wall and support member are integrally formed.

[0041] The reduced-pressure treatment system 300 also differs in that the reduced-pressure treatment system 300 has a single reduced-pressure delivery conduit 364 that provides reduced pressure to a reduced-pressure port 351, or interface. The reduced-pressure port 351 directly or in combination with additional conduit members provides reduced

pressure to a pressure management device, such as a pop valve 369. The pop valve 369 allows reduced pressure below a reduced-pressure threshold (RPT) to be delivered to the interior space 338 through a conduit exit 371. Any number of pop valve arrangements may be used for the pop valve 369.

[0042] Functionally, the pop valve 369 allows reduced pressure to evacuate the interior space 338 sufficiently to cause the variable wound cover 310 to enter the rigid state (less-pliable state) before a deforming load is placed on the variable wound cover 310 by reduced pressure being delivered to the treatment space 358. When the reduced pressure delivered by the reduced-pressure port 351 exceeds the reduced-pressure threshold (RPT), e.g., increases beyond -100 mm Hg, a -150 mm Hg, or other RPT, a portion of the pop valve 369 allows reduced pressure to enter a reduced-pressure conduit 373 and thereby is delivered to the treatment space 358 through a second reduced-pressure exit 375. A wicking member 366 may be associated with the second reduced-pressure exit 375. With the arrangement shown for the reduced-pressure treatment system 300, a single reduced-pressure source may be utilized and the variable wound cover 310 will enter the rigid state (less-pliable state) before a reduced pressure is delivered to the treatment space 358.

[0043] Although the present invention and its advantages have been disclosed in the context of certain illustrative, non-limiting embodiments, it should be understood that various changes, substitutions, permutations, and alterations can be made without departing from the scope of the invention as defined by the appended claims. It will be appreciated that any feature that is described in a connection to any one embodiment may also be applicable to any other embodiment.

CLAIMS

What is claimed is:

Claim 1. A system for providing reduced-pressure treatment to a tissue site on a wound bed of a patient, the system comprising:

a variable wound dressing, the variable wound dressing comprising: a variable cover that is pliable at ambient pressure and less pliable when placed under reduced pressure, the variable cover for placing over the tissue site;

wherein the variable wound dressing has a first side and a second, patient-facing side, and wherein a treatment space is formed between the second, patient-facing side of the variable wound dressing and the wound bed;

a first reduced-pressure port in fluid communication with the variable cover and operable to supply reduced pressure within the variable cover;

a second reduced-pressure port in fluid communication with the treatment space; and

a reduced-pressure subsystem operable to supply reduced pressure to the first reduced-pressure port and the second reduced-pressure port.

Claim 2. The system of claim 1, wherein the second reduced-pressure port has a first portion and a second portion, and further comprising a wicking member associated with the second portion of the second reduced-pressure port.

Claim 3. The system of claim 1, wherein the variable cover has a first side and a second, patient-facing side and wherein the variable wound dressing further comprises a support member adjacent the second, patient-facing side of the variable cover.

Claim 4. The system of claim 1, wherein the variable cover has a first side and a second, patient-facing side and further comprising a support member coupled to the second, patient-facing side of the variable cover.

Claim 5. The system of claim 1, wherein the variable cover comprises a sealed envelope defining an interior space and further comprising a plurality of spacing members disposed within the interior space.

Claim 6. The system of claim 1, wherein the variable cover comprises a sealed envelope defining an interior space and further comprising a plurality of spacing members

disposed within the interior space, and wherein the spacing members comprise a plurality of polymer beads.

Claim 7. The system of claim 1, wherein the variable cover comprises a sealed envelope defining an interior space and further comprising a plurality of spacing members disposed within the interior space, and wherein the spacing members comprise a plurality of polystyrene balls.

Claim 8. The system of claim 1, wherein the reduced-pressure subsystem comprises:

a reduced-pressure source;

a three-way valve fluidly coupled to the reduced-pressure source, the first reduced-pressure port, and the second reduced-pressure port; and

wherein the three-way valve is operable to provide reduced-pressure to the first reduced-pressure port and the second reduced-pressure port.

Claim 9. The system of claim 1, further comprising an over-drape for sealing at least a portion of the variable cover to the patient.

Claim 10. The system of claim 1, wherein:

the second reduced-pressure port has a first portion and a second portion, and further comprising a wicking member associated with the second portion of the second reduced-pressure port;

the variable cover has a first side and a second, patient-facing side and wherein the variable wound dressing further comprises a support member adjacent the second, patient-facing side of the variable cover; and

the variable cover comprises a sealed envelope defining an interior space and further comprising a plurality of spacing members disposed within the interior space.

Claim 11. The system of claim 1, wherein the first reduced-pressure port and the second reduced-pressure port comprises a single reduced-pressure port having a valve.

Claim 12. A method for providing reduced-pressure treatment to a tissue site of a patient, the method comprising the steps of:

providing a variable wound dressing having an interior space, the variable wound dressing have a pliable state and a less-pliable state, and wherein the variable wound dressing is operable to change from the pliable state to the less-pliable state in the presence of reduced pressure;

disposing the variable wound dressing over the tissue site, whereby a treatment space is formed between the tissue site and the variable wound dressing;

forming a fluid seal over the tissue site;

providing reduced pressure to the interior space of the variable wound dressing; and

providing reduced pressure to the treatment space.

Claim 13. The method of claim 12, further comprising the step of associating a wicking member with the variable wound dressing.

Claim 14. The method of claim 12, further comprising the step of disposing a support member over the tissue site.

Claim 15. The method of claim 12, wherein the variable wound dressing comprises a variable cover and a support member, and wherein the step of disposing the variable wound dressing over the tissue site comprises the steps of disposing the support member over the tissue site and disposing the variable cover over the tissue site.

Claim 16. The method of claim 12, wherein the variable wound dressing comprises a variable cover, and the variable cover comprises a sealed envelope defining the interior space and a plurality of spacing members disposed within the interior space.

Claim 17. The method of claim 12, wherein the variable wound dressing comprises a variable cover, and the variable cover comprises a sealed envelope defining the interior space and a plurality of polymer beads disposed within the interior space.

Claim 18. The method of claim 12, wherein the variable wound dressing comprises a variable cover, and the variable cover comprises a sealed envelope defining the interior space and a plurality of polystyrene balls disposed within the interior space.

Claim 19. The method of claim 12, further comprising the step of applying an over-drape over at least a portion of the variable wound dressing for form a fluid seal between the variable wound dressing and the patient.

Claim 20. A method of manufacturing a variable wound dressing for use as part of a reduced-pressure wound treatment system, the method comprising the steps of:

providing an envelope having an interior space and having a first side and a second, patient-facing side;

disposing a plurality of spacing members within the interior space;

sealing the interior space;

forming a first reduced-pressure aperture on the envelope for providing fluid communication to the interior space; and

forming a second reduced-pressure aperture through the envelope for providing fluid communication from the first side of the envelope to the second, patient-facing side of the envelope.

Claim 21. The method of claim 20, wherein the envelope comprises a first wall and a second wall, and wherein the first reduced-pressure aperture is formed through the first wall.

Claim 22. The method of claim 20, wherein the envelope comprises a first wall and a second wall, and wherein the second reduced-pressure aperture is formed through the first wall and the second wall.

Claim 23. The method of claim 20, wherein the envelope comprises a first wall and a second wall, and wherein the step of sealing the envelope comprises placing the first wall and second wall together and bonding a perimeter.

Claim 24. The method of claim 20, wherein the envelope comprises a first wall and a second wall, and wherein the method further comprises forming the envelope by placing the first wall and second wall together and bonding a portion of a perimeter, and further comprising coupling a support member to the second wall.

Claim 25. The method of claim 20,

wherein the envelope comprises a first wall and a second wall;

wherein the method further comprises forming the envelope by placing the first wall and second wall together and bonding a portion of a perimeter;

further comprising coupling a support member to the second wall;

wherein a first reduced-pressure aperture is formed through the first wall; and

wherein a second reduced-pressure aperture is formed through the first wall and the second wall.

Claim 26. A variable, reduced-pressure wound dressing for treating a tissue site on a patient, the variable, reduced-pressure wound dressing comprising:

a variable cover having a first side and a second, tissue-facing side, the variable cover comprising:

a sealed envelope having a first wall coupled to a second wall to define an interior space between a portion of the first wall and a portion of the second wall;

a plurality of spacing members disposed within the interior space; and

wherein the variable cover is pliable at ambient pressure and less pliable when placed under reduced pressure, the variable cover for placing over the tissue site.

Claim 27. The variable, reduced-pressure wound dressing of claim 26, further comprising:

a first reduced-pressure port in fluid communication with the variable cover and operable to supply reduced pressure within the interior space; and

a second reduced-pressure port extending through the variable cover.

Claim 28. The variable, reduced-pressure wound dressing of claim 26, further comprising:

a reduced-pressure port in fluid communication with the interior space and in fluid communication with the tissue-facing side of the variable cover.

Claim 29. The variable, reduced-pressure wound dressing of claim 26, wherein the interior space has a first volume (V_1) at a first reduced pressure (P_1) and a second volume (V_2) at a second reduced pressure (P_2), wherein first reduced pressure (P_1) and second reduced pressure (P_2) are less than ambient pressure, and wherein $P_1 > P_2$ on an absolute pressure scale and $V_1 > V_2$.

Claim 30. The variable, reduced-pressure wound dressing of claim 26, wherein the interior space has a first volume (V_1) at a first reduced pressure (P_1) and a second volume (V_2) at a second reduced pressure (P_2), wherein first reduced pressure (P_1) and second reduced pressure (P_2) are less than ambient pressure, wherein $P_1 > P_2$ on an

absolute pressure scale and $V_1 > V_2$; and wherein the variable cover is less pliable at the second reduced pressure (P_2) than the first reduced pressure (P_1).

Claim 31. The variable, reduced-pressure wound dressing of claim 26, further comprising a support member having a first side and a second, patient-facing side, and wherein the first side of the support member is coupled to the second, patient-facing side of the variable cover.

Claim 32. The variable, reduced-pressure wound dressing of claim 26, further comprising a support member having a first side and a second, patient-facing side, and wherein the first side of the support member is coupled to the second, patient-facing side of the variable cover and the support member comprises a high-density polyethylene sheet.

Claim 33. The variable, reduced-pressure wound dressing of claim 26, further comprising a support member having a first side and a second, patient-facing side, and wherein the first side of the support member is coupled to the second, patient-facing side of the variable cover and the support member comprises a closed-cell foam.

Claim 34. The variable, reduced-pressure wound dressing of claim 26, wherein the spacing members comprise polymer beads.

Claim 35. The variable, reduced-pressure wound dressing of claim 26, wherein the spacing members comprise polystyrene balls.

Claim 36. The variable, reduced-pressure wound dressing of claim 26, wherein the spacing members comprise irregular-shaped polymer members.

Claim 37. A system for providing reduced-pressure treatment to a tissue site on a wound bed of a patient, the system comprising:

a variable wound dressing, the variable wound dressing comprising:

a variable cover having a first side and a second, tissue-facing side, the variable cover comprising:

a sealed envelope having a first wall coupled to a second wall to define an interior space between a portion of the first wall and a portion of the second wall,

a plurality of spacing members disposed within the interior space, and

wherein the variable cover is pliable at ambient pressure and less pliable when placed under reduced pressure, the variable cover for placing over the tissue site;

wherein the variable wound dressing has a first side and a second, patient-facing side, and wherein a treatment space is formed between the second, patient-facing side of the variable wound dressing and the wound bed;

a first reduced-pressure port in fluid communication with the variable cover and operable to supply reduced pressure within the variable cover;

a second reduced-pressure port in fluid communication with the treatment space; and

a reduced-pressure subsystem operable to supply reduced pressure to the first reduced-pressure port and the second reduced-pressure port.

Claim 38. The system of claim 37, further comprising:

a first reduced-pressure port in fluid communication with the variable cover and operable to supply reduced pressure within the variable cover; and

a second reduced-pressure port extending through the variable cover.

Claim 39. The system of claim 37, further comprising a reduced-pressure port in fluid communication with the interior space and in fluid communication with the tissue-facing side of the variable cover.

Claim 40. The system of claim 37, wherein the interior space has a first volume (V_1) at a first reduced pressure (P_1), wherein first reduced pressure (P_1) and second reduced pressure (P_2) are less than ambient pressure, and a second volume (V_2) at a second reduced pressure (P_2) and wherein $P_1 > P_2$ on an absolute pressure scale and $V_1 > V_2$.

Claim 41. The system of claim 37 wherein the interior space has a first volume (V_1) at a first reduced pressure (P_1), wherein first reduced pressure (P_1) and second reduced pressure (P_2) are less than ambient pressure, and a second volume (V_2) at a second reduced pressure (P_2) and wherein $P_1 > P_2$ on an absolute pressure scale and $V_1 > V_2$; and wherein the variable cover is less pliable at the second reduced pressure (P_2) than the first reduced pressure (P_1).