US 20140263322A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2014/0263322 A1

(43) Pub. Date: Sep. 18, 2014

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(54) **CORING-FREE VALVE SYSTEM**

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(21) Appl. No.: **13/802,935**

(22) Filed: **Mar. 14, 2013**

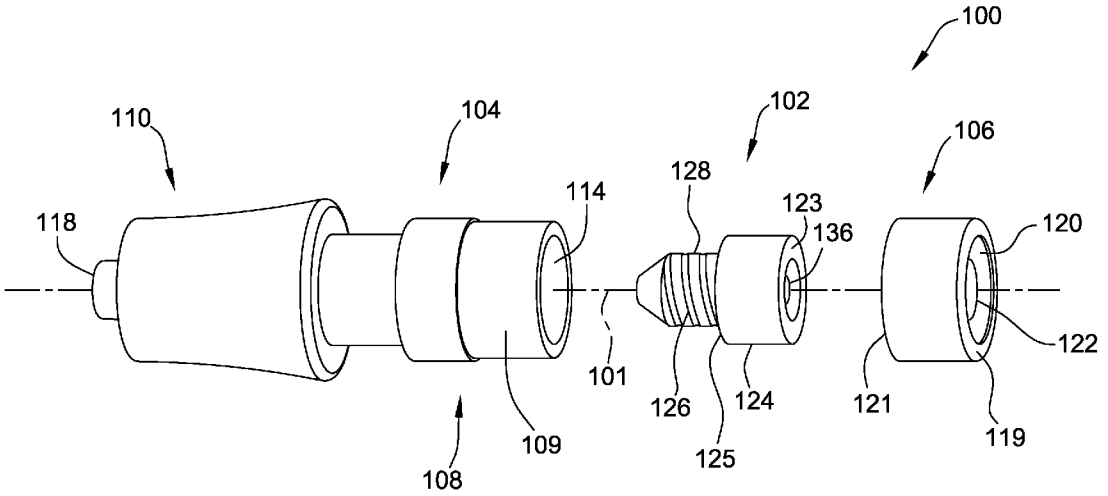
Publication Classification

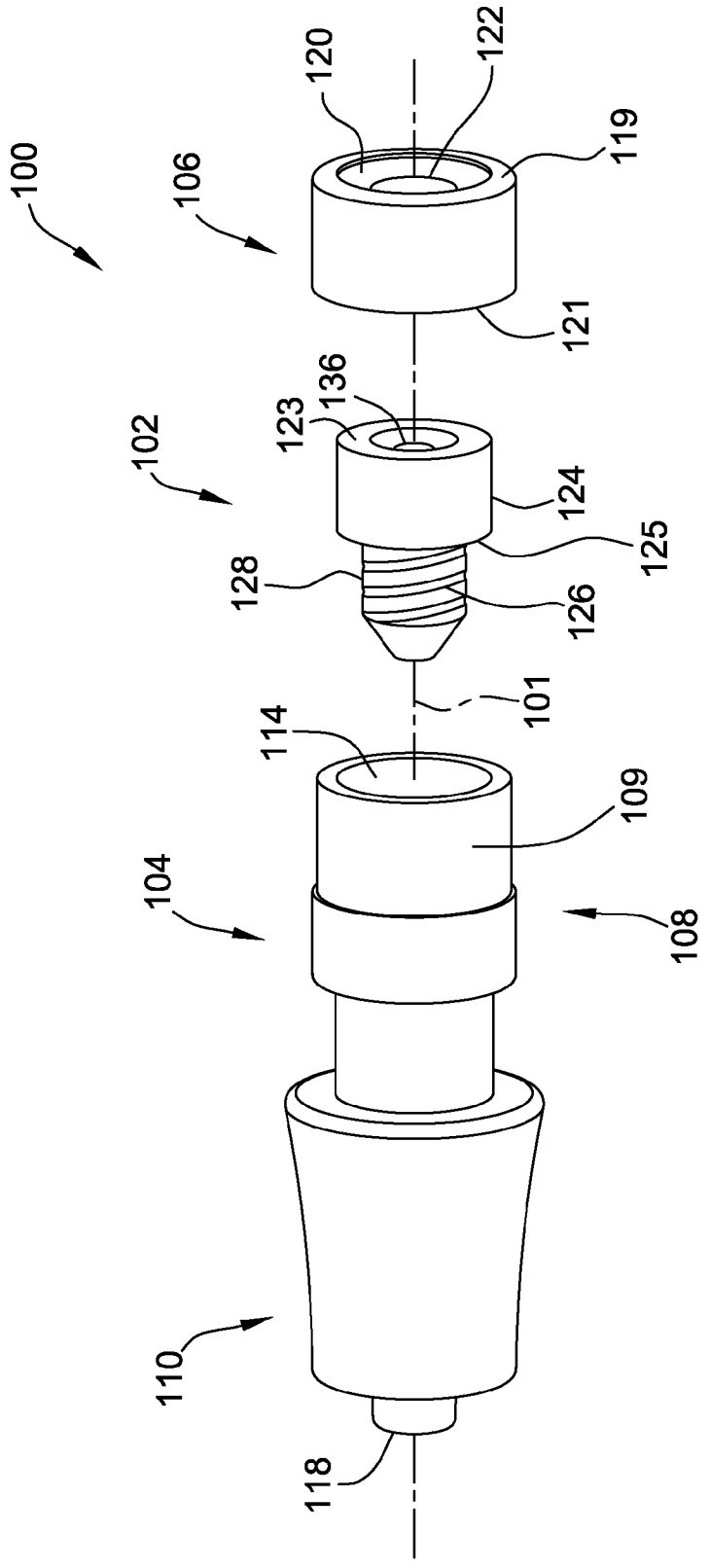
(51) **Int. Cl.**
B65D 51/00 (2006.01)

(52) **U.S. Cl.**
CPC ***B65D 51/002*** (2013.01)
USPC **220/257.1**

(57) **ABSTRACT**

A system for receiving a needle includes a valve that defines a fluid flow channel, and a housing having a first end, a second end, and a receiving portion. The system further includes a septum formed from a resilient material and mounted in the housing. The septum includes a head portion including a tapered opening, a sealing portion, and an expansion portion extending from the head portion opposite the tapered opening. The expansion portion includes a chamber having a closed end, at least one relief channel, and a plurality of apertures formed in the relief channel. The plurality of apertures facilitates fluid communication between the chamber and the receiving portion when the expansion portion is in an open position.




100
106
120
122
119
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102
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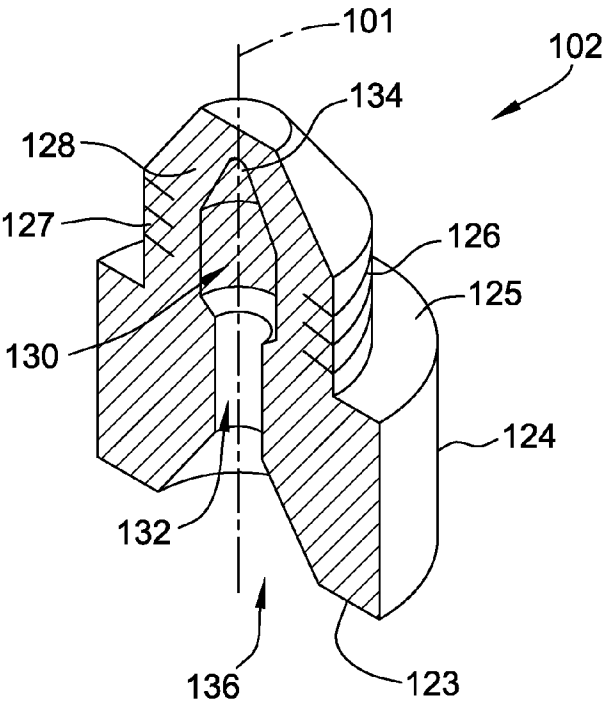
114
109
104
108
110
118

FIG. 1

FIG. 2A


101
102
134
128
127
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130
124
132
136
123

FIG. 2B

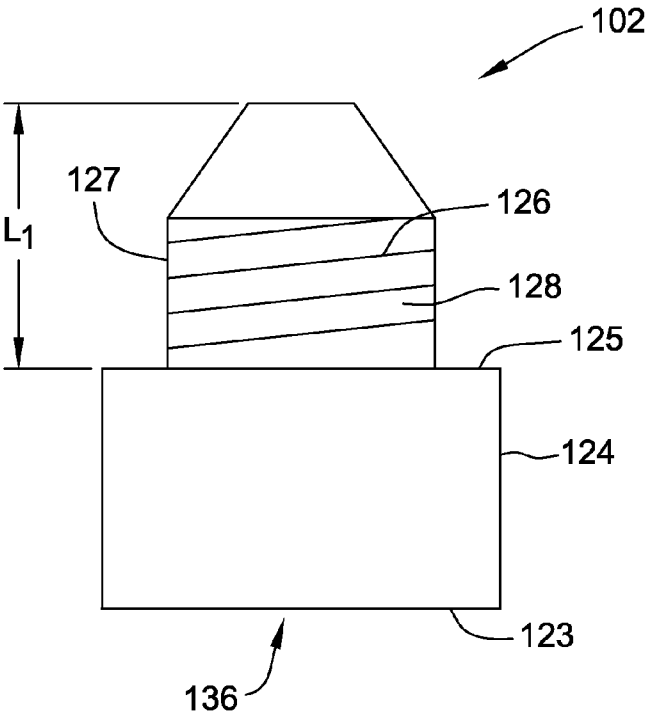

102
127
126
L1
128
125
124
123
136

FIG. 3A

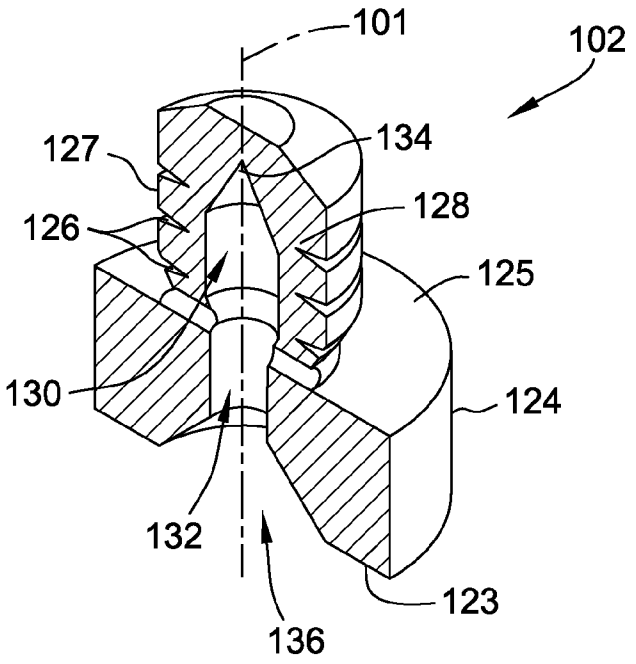

101
102
127
134
128
126
125
130
124
132
123
136

FIG. 3B

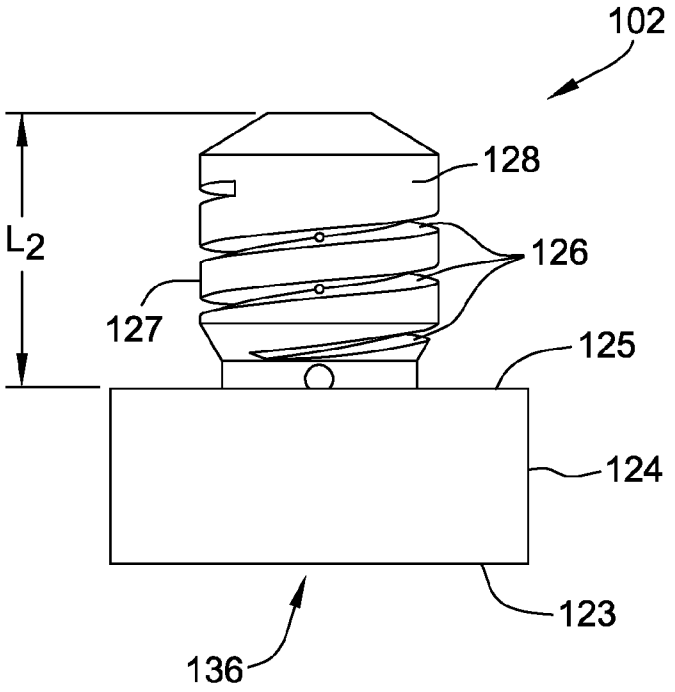
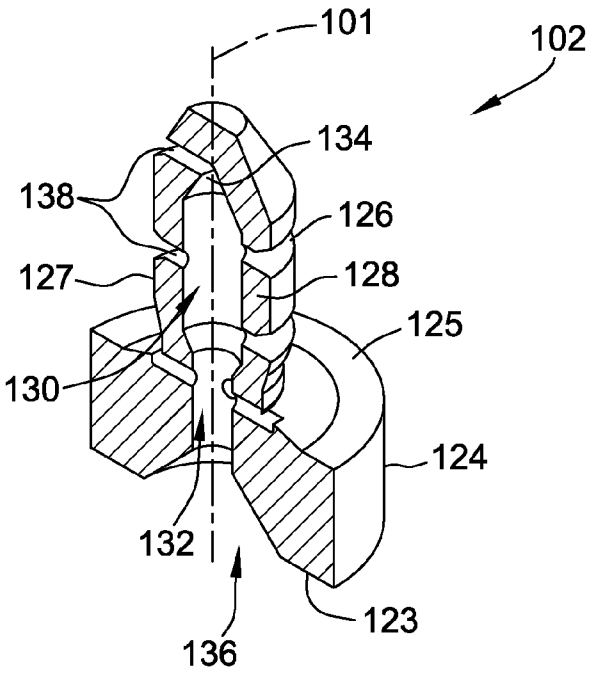

102
128
L_2
126
127
125
124
123
136

FIG. 4A


101
102
134
138
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128
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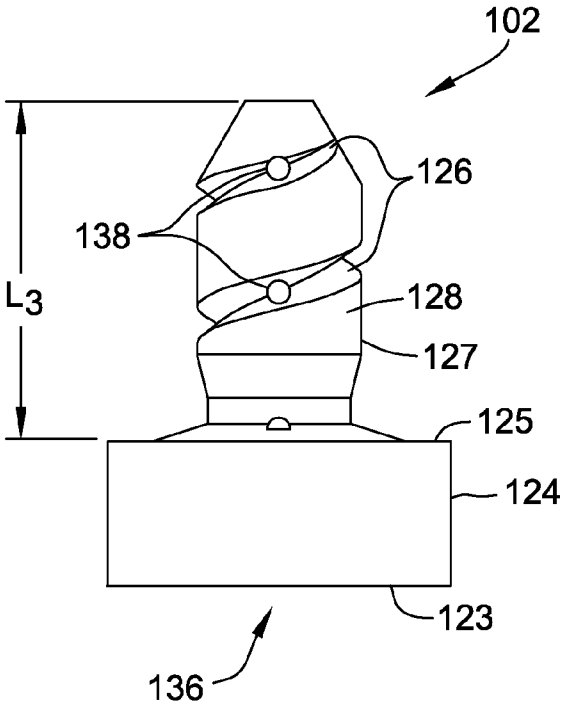
130
124
132
123
136

FIG. 4B


102
126
138
L_3
128
127
125
124
123
136

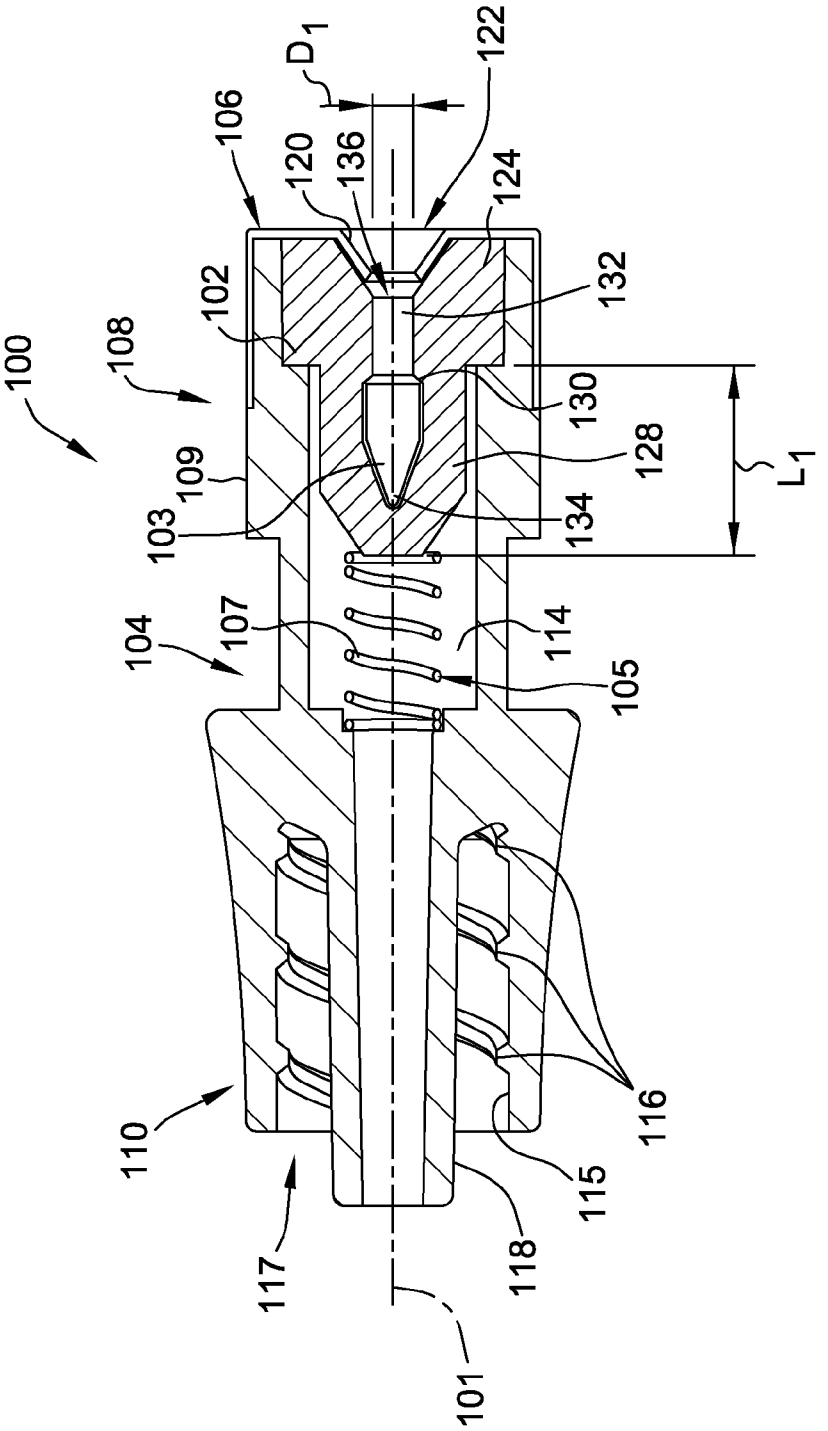

100
101
102
103
104
105
106
107
108
109
110
114
115
116
117
118
120
122
124
128
130
132
134
136
D_1
L_1

FIG. 5

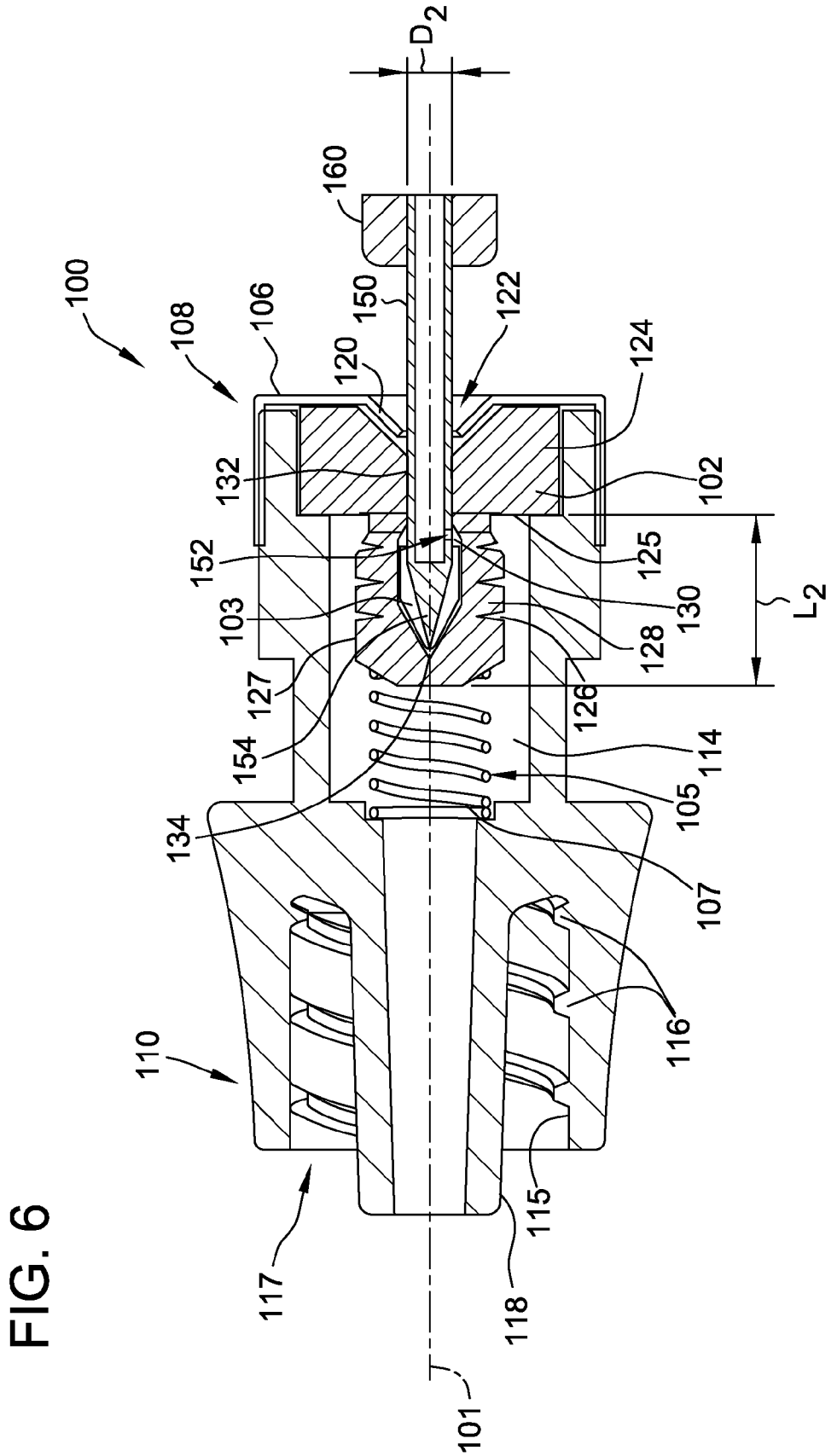
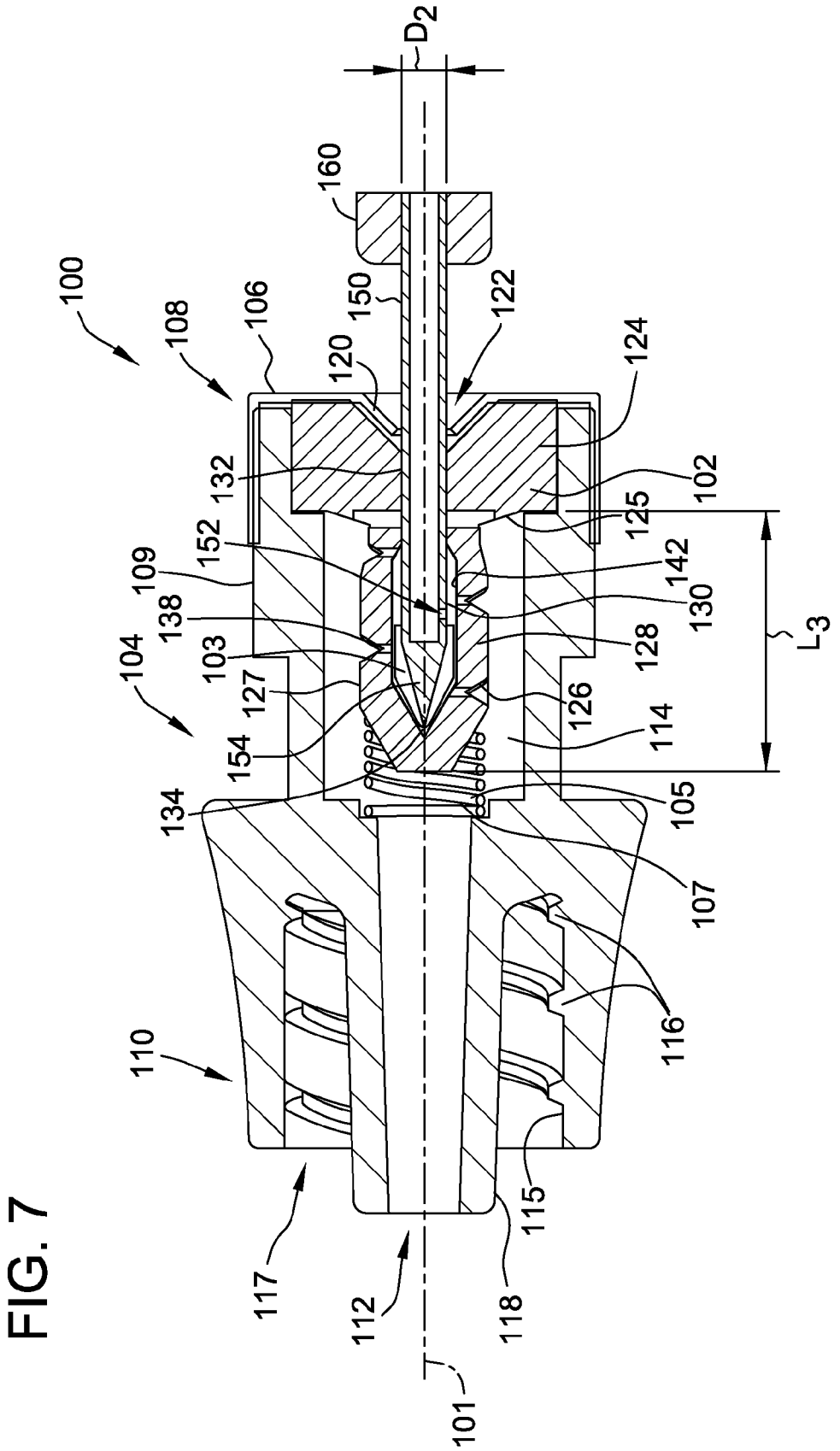

D2
160
100
108
106
150
122
120
124
132
102
152
125
103
130
128
L2
127
126
154
114
105
134
107
110
116
115
117
118
101

FIG. 6


D2
160
100
108
106
150
122
120
124
132
102
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152
142
109
130
138
128
L3
104
103
127
126
154
114
134
105
107
110
116
115
117
112
118
101

FIG. 7

CORING-FREE VALVE SYSTEM

FIELD

[0001] The field relates generally to fluid valve systems, and more particularly to fluid valve systems having septa or a septum for receiving a needle.

BACKGROUND

[0002] Many conventional valve systems for sealing a container, especially those used in a medical or therapeutic setting, include a septum designed to be pierced by a needle or cannula of a syringe. Fluid may be transferred through the needle from the container to the syringe or vice versa.

[0003] Conventional needles often have holes at or near the tip of the needle. Holes through the septum formed by the needle may have an undesirable coring effect on the septum in which the needle undesirably removes a piece of the septum and creates particulates. These particulates may clog the needle or tube and obstruct the flow path of the fluid, or be released into the flow path and possibly into the patient. The particulates may further contaminate any fluid flowing through the flow path. Some septa have a pre-formed slit designed to receive the needle, but the needle may pierce the septum anywhere the tip makes contact, and may not necessarily be inserted through the slit area.

[0004] Moreover, repeated piercings of a septum by either a needle or a cannula may cause deterioration of the septum. This deterioration may lead to leakage and contamination. Many conventional valve systems and septa are designed to be used once, and repeated insertions of a needle or cannula not only introduce particulates into the flow path, but also facilitate leakage through the septum from stretching and overuse. It is important that the septum reseal with enough force that fluids do not leak therefrom and that airborne particulate matter, bacterial or viral matter do not enter therethrough. A more satisfactory system is needed.

[0005] This Background section is intended to introduce the reader to various aspects of art that may be related to various aspects of the present disclosure, which are described and/or claimed below. This discussion is believed to be helpful in providing the reader with background information to facilitate a better understanding of the various aspects of the present disclosure. Accordingly, it should be understood that these statements are to be read in this light, and not as admissions of prior art.

SUMMARY

[0006] In one aspect, a valve system for receiving a needle comprises a housing defining at least a portion of a fluid flow channel. The housing includes a first end, a second end, and a receiving portion. A septum is mounted in the housing for sealing the first end of the housing. The septum includes a longitudinal axis and is formed from a resilient material. The septum also includes a head portion including a tapered opening configured to receive the needle, a sealing portion configured to create a seal around the needle, and an expansion portion extending from the head portion opposite the tapered opening. The expansion portion includes a chamber having a closed end, at least one relief channel, and apertures formed in the relief channel. The apertures facilitate fluid communication between the chamber and the receiving portion when the expansion portion is extended parallel to the longitudinal axis into the receiving portion in an open position. The apertures are also configured to prevent flow communication when the expansion portion is in a closed position.

[0007] In another aspect, a septum comprises a head portion including a tapered opening configured to receive a needle about a longitudinal axis, a sealing portion configured to create a seal about a needle, and an expansion portion extending from the head portion opposite the tapered opening. The expansion portion includes a chamber having a closed end housed within the expansion portion, at least one relief channel, and a plurality of apertures formed in the relief channel. The apertures facilitate flow communication through the expansion portion when the expansion portion is extended parallel to the longitudinal axis in an open position. The apertures also prevent flow communication when the expansion portion is in a closed position.

[0008] Various refinements exist of the features noted in relation to the above-mentioned aspects. Further features may also be incorporated in the above-mentioned aspects as well. These refinements and additional features may exist individually or in any combination. For instance, various features discussed below in relation to any of the illustrated embodiments may be incorporated into any of the above-described aspects, alone or in any combination.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. **1** is an exploded perspective view of a valve system including a cap, a septum, and a housing of one embodiment;

[0010] FIG. **2**A and FIG. **2**B respectively show perspective and side views of the septum of FIG. **1** in a closed position;

[0011] FIG. **3**A and FIG. **3**B respectively show perspective and side views of the septum of FIG. **1** in an intermediate position;

[0012] FIG. **4**A and FIG. **4**B respectively show perspective and side views of the septum of FIG. **1** in an open position;

[0013] FIG. **5** is a cross-section view of the valve system of FIG. **1** with the septum in a closed position;

[0014] FIG. **6** is a cross-section view of the valve system of FIG. **1** with the septum in an intermediate position;

[0015] FIG. **7** is a cross-section view of the valve system of FIG. **1** with the septum in an open position;

DETAILED DESCRIPTION

[0016] Referring to FIG. **1**, a system generally designated **100** is for use with a medical device of a fluid delivery system. However, system **100** may be used with other devices without departing from the scope of this disclosure. In this embodiment, system **100** is configured to prevent coring of an expanding member, such as a septum **102**, when a needle (not shown in FIG. **1**) is inserted therein, while maintaining a fluid flow channel (not shown in FIG. **1**) therethrough. System **100** includes a cap **106** having a tapered opening **122** for receiving the needle, a housing **104** having a first end **108** for receiving cap **106**, a receiving chamber **114** for receiving septum **102** that controls fluid flow through system **100**, and a second end **110** to facilitate directing fluid between system **100** and a medical device. Housing **104**, septum **102**, and cap **106** are configured to be coaxially aligned along longitudinal centerline axis **101**. In this embodiment, the fluid is in liquid form and passes through a centrally formed fluid flow channel as described in further detail below.

[0017] Many known medical devices are configured to facilitate the passage of fluids therethrough. The term "medi-

cal device" may be used to indicate such medical instruments as surgical tubing, syringes, IV sets, medical valve connectors, and other such devices. Medical devices may include, but are not limited to the above list. As described below, valve system **100** may be connected to a medical valve connector, such as a Luer connector. However, system **100** may be used to transfer a fluid between any two devices. For example, for transferring fluid between a needle or cannula and a vial, for use in a pumping system for filling or emptying a vial or tube, or for transferring fluid between a needle and an IV line. Furthermore, a conventional needle, such as a bevel-tipped needle may be used, or a blunt-tipped cannula including a side port. Alternatively, any needle or cannula may be used with system **100**.

[0018] In this embodiment, septum **102** is mounted within housing **104** of system **100** for sealing housing first end **108** and is substantially secured within housing **104** by cap **106**. Although system **100** is designed as a two-way fluid connector valve for flow of fluid between two medical devices, it is to be understood that the direction of fluid flow as well as the particular details, size and shape of system **100** and its components may vary, including providing for one-way fluid flow, if desired.

[0019] As shown in FIG. **1**, cap **106** is configured to be coupled to first end **108** of housing **104**. In this embodiment, cap **106** is coupled to housing **104** via a press-fit connection. Alternatively, cap **106** may be coupled to first end **108** of housing **104** by any connection means that allows for system **100** to function as described herein, such as threadably coupled, snap-fit, or permanently attached. Cap **106** includes a first end **119** and an opposing second end **121**. Cap first end **119** includes conically-tapered opening **122** that narrows within cap **106** and is defined by an annular guiding surface **120**. Guiding surface **120** extends into cap **106** such that opening **122** terminates between first end **119** and second end **121**. Guiding surface **120** is configured to direct the needle through taped opening **122**. Cap **106** is formed of a hard, durable material such that contact with the needle does not damage cap **106**.

[0020] In this embodiment, septum **102** includes two adjacent elements or portions. In particular, septum **102** includes a head portion **124** and an expansion portion **128**. A first end **123** of head portion **124** includes a second tapered opening **136** configured to receive a needle and expansion portion **128** includes a chamber (not shown in FIG. **1**) defined therein and a relief channel **126**. Expansion portion **128** extends from a head portion second end **125** opposite tapered opening **136**. A sealing portion (not shown in FIG. **1**) is defined within septum **102** between tapered opening **136** and the chamber. The sealing portion is configured to create a seal about the needle. The chamber is configured to receive the needle such that a pushing force by the needle facilitates to elongate expansion portion **128** along axis **101** as described in further detail below.

[0021] Housing **104** includes first end **108** and opposing second and **110**. First end **108** is configured to accept cap **106** on an outer surface **109** and is further configured to receive septum **102** within receiving chamber **114** within first end **108**. Second end **110** includes a fluid flow member **118** and a connector portion (not shown in FIG. **1**) for connecting system **100** to a medical device, such as a Luer device. The connector portion may be threaded for ease of connection to the device. It is to be noted that any type of medical device may be connected to the connector portion of the second end **110**. For ease of description, system **100** will be described with respect to the needle of a syringe being inserted into opening **122** and a Luer device being connected to the connector portion of the second end **110**, where the Luer device is in communication with a fluid delivery system, such as an I.V. set. The Luer device and I.V. set are omitted from the drawings for brevity.

[0022] FIGS. **2**A, **3**A, and **4**A illustrate a cross-sectional perspective view of septum **102** in the closed position, intermediate position, and open position, respectively. FIGS. **2**B, **3**B, and **4**B show a perspective side view of septum **102** in the closed position, intermediate position, and open position, respectively. Septum **102** is made of a single piece of a substantially resilient material, such as rubber, latex, or silicone. Alternatively, septum **102** may be formed of any resilient material that enables system **100** to function as described herein. As described above, septum **102** includes head portion **124** and expansion portion **128**. Head portion **124** includes first end **123** and opposing second end **125**. Tapered opening **136** extends from head portion first end **123** toward head portion second end **125**. Opening **136** is shaped substantially similarly to opening **122** such that guide surface **120** is received into opening **136** so as to direct the needle simultaneously through opening **122** of cap **106** and opening **136** of septum **102**. A sealing portion **132** is defined within head portion **124** of septum **102**. Sealing portion **132** extends from head portion second end **125** toward head portion first end **123**. Tapered opening **136** and sealing portion **132** are in flow communication such that a channel is defined through head portion **124** between first and second ends **123** and **125**.

[0023] In this embodiment, expansion portion **128** extends from head portion second end **125** opposite sealing portion **132** and opening **136**. Expansion portion **128** includes a chamber **130** defined therein. Chamber **130** extends within expansion portion **128** between sealing portion **132** and a closed end **134** of chamber **130**. Septum **102** is configured such that opening **136**, sealing portion **132**, and chamber **130** are co-axial about centerline **101** and form a single-ended tunnel between head portion first end **123** and chamber closed end **134**.

[0024] Expansion portion **128** further includes a relief channel **126** formed in an outer wall **127** of expansion portion **128** and has a depth of approximately half the thickness of outer wall **127**. Alternatively, relief channel **126** may be of any depth that facilitates septum **102** to function as described herein. In this embodiment, relief channel **126** is a continuously-spiraled channel defined between head portion second end **125** and a distal tip of expansion portion **128**. Relief channel **126** terminates with a complete circular cut about the base of extension portion **128** at the union of expansion portion **128** and head portion second end **125**. Alternatively, relief channel **126** may be a plurality or series of individual channels formed in outer wall **127**.

[0025] FIGS. **2**A and **2**B show septum **102** in the relaxed, or closed, position, wherein expansion portion **128** is at rest and has a first length L_1. In the closed position, relief channel **126** is closed and appears as a spiraled line about expansion portion **128**. FIGS. **3**A and **3**B show septum **102** in an intermediate position, wherein expansion portion **128** is at least partially expanded. In the intermediate position, expansion portion **128** has a second length L_2, which is greater than first length L_1. Furthermore, extension portion **128** is extended in a longitudinal direction along axis **101** such that relief channel **126** becomes more defined and begins to separate. Expansion portion **128** lengthens in the intermediate position such

that the interior volume of chamber **130** is greater in the intermediate position than in the closed position. FIGS. **4**A and **4**B show septum **102** in the fully open position, wherein expansion portion **128** has a third length L_3 greater than first and second lengths, L_1 and L_2. In the open position, expansion portion **128** is fully expanded and the interior volume of chamber **130** is greater in the open position than in the intermediate and closed positions. In the open position, relief channel **126** is fully open and exposes a plurality of apertures **138** defined within relief channel **126**. Apertures **138** facilitate flow communication through outer wall **127** of expansion portion **128** between chamber **130** and the atmosphere surrounding expansion portion **128**. In this embodiment, apertures **138** facilitate fluid flow through expansion portion **128** between chamber **130** and receiving chamber **114** of housing **104** when expansion portion **128** is extended parallel to longitudinal axis **101** into receiving chamber **114** in the open position, as shown in FIGS. **5**-**7**.

[0026] FIG. **5** is a cross-section of system **100** with septum **102** in the closed position. FIG. **6** is a cross-section view of system **100** with septum **102** in the intermediate position. FIG. **7** is a cross-section view of system **100** with septum **102** in the open position. In this embodiment, septum **102** is configured to seal first end **108** of housing **104**. Specifically, septum **102** is mounted into receiving chamber **114** of housing **104**. Septum **102** is contained within receiving chamber **114** by cap **106**, which is coupled to first end **108** of housing **104**. Specifically, cap **106** is coupled to outer surface **109** of housing first end **108** via a press-fit. Alternatively, cap **106** may be removably coupled to housing first end via interlocking threads or any other removable coupling means. System **100** is configured such that guide surface **120** of cap **106** is adjacent to tapered opening **136** such that opening **122** of cap **106**, tapered opening **136**, and sealing portion **132** of septum head portion **124** are coaxial along center axis **101** to simultaneously receive a needle **150** inserted therethrough.

[0027] Expansion portion **128** extends a distance L_1 into receiving chamber **114** of housing **104** from head portion **124** of septum **102** when in the closed position (shown in FIG. **5**). In the closed position, sealing portion **132** has a first diameter D_1. System **100** further includes a nosecone **103** housed within closed end **134** of chamber **130** of septum **102**. In this embodiment, nosecone **103** is formed of a metallic material, such as stainless steel, and is configured to prevent the piercing of septum **102** by needle **150** and to facilitate extension of expansion portion **128** during a transition from the closed position to the open position to establish a fluid flow channel as described in further detail below. Furthermore, nosecone **103** is configured to align expansion portion **128** with longitudinal axis **101**.

[0028] System **100** further includes a biasing mechanism **105** to facilitate operation of system **100**, and, more specifically, septum **102**. In this embodiment, biasing mechanism **105** is a coil spring **107** positioned within receiving chamber **114** of housing **104** between fluid flow member **118** and a distal end of expansion portion **128**. Alternatively, biasing mechanism **105** may be a spring that forms a portion of the resilient material comprising expansion portion **128** of septum **102**. Biasing mechanism **105** is configured to facilitate closure of septum **102** when transitioning from the open position to the closed position as described in further detail below.

[0029] In this embodiment, housing second end **110** of system **100** includes fluid flow member **118** and connector portion **117** for coupling system **100** to a medical device (not shown). Fluid flow member **118** extends between housing second end **110** and receiving chamber **114** through connector portion **117**, and is coaxial with receiving chamber **114**, expansion portion **128**, and openings **136** and **122** along center axis **101**. Fluid flow member **118** is configured to facilitate the passage of fluid through system **100**. An interior surface **115** of housing connector portion **117** is formed to include one or more threads or similar members **116** for connection of medical device, such as a Luer device. It is to be noted that any type of medical device may be connected to connector portion **117** of second end **110**. For ease of description, system **100** will be described with respect to needle **150** of a syringe **160** being inserted into opening **122** and a Luer device being connected to connector portion **117** of the second end **110**, where the Luer device is in communication with a fluid delivery system, such as an I.V. set. The Luer device and I.V. set are omitted from the drawings for simplicity.

[0030] In operation, the Luer device of this embodiment is threadably coupled to connector portion **117** of housing second end **110**. FIG. **6** shows syringe **160** and needle **150**, having a diameter D_2, being inserted into system **100** with septum **102** in the intermediate position. Needle **150** is directed by guide surface **120** into system **100** through cap opening **122** and septum opening **136**. Guide surface **120** is configured to direct needle **150** through openings **122** and **136** and also to protect from a tip **154** of needle **150** damaging head portion **124** of septum **102**. In this embodiment, diameter D_1 (shown in FIG. **5**) of sealing portion **132** in the closed position is smaller than the diameter D_2 of needle, such that as needle **150** penetrates opening **136**, sealing portion **132** of septum **102** expands radially to accommodate the larger diameter needle **150**. Accordingly, a seal is created about needle **150** at sealing portion **132** of septum **102** that excludes exterior gases, liquids, or airborne matter from housing **104**.

[0031] As needle **150** is inserted through sealing portion, needle tip **154** advances through chamber **130** and impinges nosecone **103** at closed end **134** of chamber **130**. In this embodiment, nosecone **103** prevents the piercing or coring of septum **102** by needle tip **154**. By preventing such coring, system **100** eliminates the possibility of particulates from septum **102** clogging needle **150**, contaminating the fluid transferred, or being introduced into the patient. During advancement of needle **150** into system **100**, when septum **102** is in the intermediate position (shown in FIG. **6**), insertion of needle **150** facilitates deformation of septum **102** by extending expansion portion **128** into receiving chamber a distance L_2, which is greater than distance L_1. Relief channel **126** facilitates such expansion by allowing expansion portion **128** to extend into receiving chamber **114** along center axis **101**. The extension of expansion portion **128** compresses biasing mechanism **105** and coil spring **107** within receiving chamber **114**. Spring **107** provides resistance to and limits the extension of expansion portion **128** within receiving chamber **114** to avoid damage to septum **102** when septum **102** is in the open position (shown in FIG. **7**).

[0032] In this embodiment, as needle **150** is advanced farther into system **100**, expansion portion **128** transitions from the intermediate position to the open position. The continued force of needle tip **154** upon nosecone **103** extends expansion portion **128** parallel to axis **101** into receiving chamber **114** a distance L_3, which is greater than both distances L_1 and L_2, in the open position. Nosecone **103** also prevents obstruction of a needle side port **152** by an interior wall **142** of chamber **130**

by acting as a spacer between side port **152** and interior wall **142**. The extension of expansion portion **128** further compresses spring **107** such that spring **107** limits the extension of expansion portion **128** to prevent damaging septum **102**. In this embodiment, expansion portion **128** is fully extended in the open position such that relief channel **126** fully opens to expose a plurality of apertures **138** defined therein.

[0033] In the open position of FIG. **7**, fluid flow member **118**, receiving chamber **114**, and septum **102** form a fluid flow channel **112** through housing **104** of system **100** to facilitate the transfer of fluid between syringe **160** and the Luer device. Accordingly, when septum **102** is in the open position, fluid may flow through the following structures (in the noted order), which as a whole make up fluid flow channel **112**: syringe **160**; needle **150**; chamber **130** (via needle side port **152**); receiving chamber **114** (via apertures **138**); fluid flow member **118**; and the Luer device.

[0034] The plurality of apertures **138** and extension of expansion portion **128** facilitate fluid communication between syringe **160** and the inside of system housing **104**. Specifically, apertures **138** establish flow channel **112** between needle **150** and receiving chamber **114**. Syringe **160** may then be activated to discharge fluid from syringe **160** through channel **112** into the Luer device or to withdraw fluid from the Luer device through channel **112** into syringe **160**. Once operation of syringe **160** is complete, needle **150** may be withdrawn from system **100**. Spring **107** facilitates closure of septum **102** upon removal of needle **150** from septum **102** and maintains closure when septum **102** is not in use. Expansion portion **128** is compressed along center axis **101** by spring **107** to close the plurality of apertures **138** and seal chamber **130** from receiving chamber **114**, thus providing a positive seal to prevent fluid communication and reduce contamination when expansion portion **128** is in the closed position.

[0035] The valve system is configured to prevent the piercing or coring of an expanding member, or septum, when a needle is inserted for fluid transfer through the system. The system described herein includes a housing, the septum, and a cap to contain the septum within the housing. The septum is formed from a resilient material and includes an expansion portion that extends into a receiving chamber of the housing from a closed position to an open position. The expansion portion includes a relief channel that facilitates such expansion and includes a plurality of apertures formed in the relief channel that are exposed when the septum is fully extended. The plurality of apertures facilitates the establishment of a fluid flow channel through the system between the needle and a medical device coupled to the opposite end of the system housing. Although the system is described as being connected to a Luer connector, the septum may be used in transferring a fluid between other types of devices. For example, for transferring fluid between a needle or cannula and a vial, for use in a pumping system for filling or emptying a vial or tube, or for transferring fluid between a needle and an IV line. A conventional needle, such as a bevel-tipped needle may be used, or a blunt-tipped cannula including a side port. After the transfer of desired fluid, removal of the needle from the septum returns the septum to its closed position. Closing may be aided by the presence of a biasing mechanism within the housing for returning and maintaining the septum in a closed position, and sealing the septum from contaminates when not in use.

[0036] To facilitate expansion of the septum from the closed position to the open position, the tip of the needle contacts a nosecone housed within a chamber within the expansion portion. The force of the needle advancing into the septum causes the expansion of the expansion portion. The nosecone not only facilitates extending the expansion portion to expose the apertures that create the fluid flow path, but also prevents the needle from coring the septum and introducing any particulates into the path. Preventing puncture or coring of the septum is particularly advantageous when the septum is used repeatedly. Exemplary embodiments of a medical valve system with an expanding member are described above in detail. The system and its components are not limited to the specific embodiments described herein, but rather, components of the valve may be used independently and separately from other components described herein. For example, the expanding member may also be used in combination with other sealing systems and methods, and are not limited to practice with only the medical valve system as described herein.

[0037] When introducing elements of the present disclosure or the embodiment(s) thereof, the articles "a", "an", "the" and "said" are intended to mean that there are one or more of the elements. The terms "comprising," "including," "containing" and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements. The use of terms indicating a particular orientation (e.g., "top", "bottom", "side", etc.) is for convenience of description and does not require any particular orientation of the item described.

[0038] As various changes could be made in the above constructions and methods without departing from the scope of the disclosure, it is intended that all matter contained in the above description and shown in the accompanying drawing (s) shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A valve system for receiving a needle comprising:

a housing defining a fluid flow channel therethrough, the housing having a first end, a second end, and a receiving portion;

a septum having a longitudinal axis and including a resilient material, the septum mounted in the housing for sealing the first end of the housing, the septum comprising:

a head portion including a tapered opening for receiving the needle;

a sealing portion for creating a seal around the needle;

an expansion portion extending from the head portion opposite the tapered opening, the expansion portion including a chamber having a closed end, the expansion portion further including a relief channel and apertures formed in the relief channel such that the apertures facilitate fluid communication between the chamber and the receiving portion when the expansion portion is extended parallel to the longitudinal axis into the receiving portion in an open position and the apertures are configured to prevent fluid communication when the expansion portion is in a closed position.

2. The valve system of claim **1**, wherein movement of the expansion portion between the open and closed positions is caused by advancing the needle through the sealing portion and into the chamber.

3. The valve system in accordance with claim 1, further comprising a housing cap on the first end of the housing.

4. The valve system in accordance with claim 3, wherein the housing cap includes a conically shaped opening for receiving the needle through the housing cap and into the head portion of the septum.

5. The valve system in accordance with claim 1, further comprising a spring for biasing the septum in the closed position when the septum is not in use and for returning the septum to the closed position from the open position upon removal of the needle from the septum.

6. The valve system in accordance with claim 5, wherein the spring forms a portion of the resilient material of the septum.

7. The valve system in accordance with claim 5, wherein the spring is a coil spring.

8. The valve system in accordance with claim 1 further comprising a nosecone within the closed end of the chamber, the nosecone adapted to prevent the needle from piercing the closed end and to align the expansion portion with the longitudinal axis.

9. The valve system in accordance with claim 8, wherein the nosecone includes a metallic material.

10. The valve system in accordance with claim 1, wherein the resilient material includes at least one of rubber, latex, or silicone.

11. The valve system in accordance with claim 1, wherein the relief channel is a spiral channel extending about the length of the expansion portion.

12. The valve system in accordance with claim 1, wherein the relief channel includes a plurality of individual channels formed in an outer wall of the expansion portion.

13. The valve system in accordance with claim 1, wherein the relief channel includes a full circular cut about a base of the extension portion.

14. The valve system in accordance with claim 1, wherein the housing includes a fluid flow member that extends between the second end and the receiving portion, the fluid flow member is configured to facilitate the passage of fluid through the valve.

15. The valve system in accordance with claim 1, wherein the housing includes a threaded portion at the second end, the threaded portion is configured to couple the valve to a medical device.

16. The valve system in accordance with claim 1, wherein the receiving portion is configured to receive the expansion portion when the expansion portion is in the open position.

17. The valve system in accordance with claim 1, wherein the sealing portion has a diameter smaller than a diameter of the needle such that a seal is formed about the needle.

18. A septum for receiving a needle comprising:

a head portion including a tapered opening having a longitudinal axis and adapted to receive the needle;

a sealing portion adapted to create a seal about the needle;

an expansion portion extending from the head portion opposite the tapered opening, the expansion portion including a chamber having a closed end housed within the expansion portion, the expansion portion further including at least one relief channel and a plurality of apertures formed in the relief channel such that the apertures facilitate flow communication through the expansion portion when the expansion portion is extended parallel to the longitudinal axis in an open position and the plurality of apertures are configured to prevent fluid communication when the expansion portion is in a closed position.

19. The septum in accordance with claim 18, wherein movement of the expansion portion between the first and second positions is facilitated by advancing the needle through the sealing portion and into the chamber.

20. The septum in accordance with claim 18, wherein the relief channel is a spiral channel about the length of expansion portion.

21. The septum in accordance with claim 18, wherein the relief channel includes a plurality of individual channels formed in an outer wall of the expansion portion.

22. The septum in accordance with claim 18, wherein the relief channel includes a full circular cut about a base of the expansion portion.

23. The septum in accordance with claim 18, wherein the sealing portion has a diameter smaller than a diameter of the needle such that a seal is formed about the needle.

24. The septum in accordance with claim 18, wherein the chamber is configured to house a metallic nosecone at the closed end, the metallic nosecone is configured to prevent the needle from piercing the closed end and to align the expansion portion with the longitudinal axis.

25. The septum in accordance with claim 18, wherein the septum is comprised of a resilient material.

26. The septum in accordance with claim 25, wherein the resilient material is one of rubber, latex, or silicone.

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