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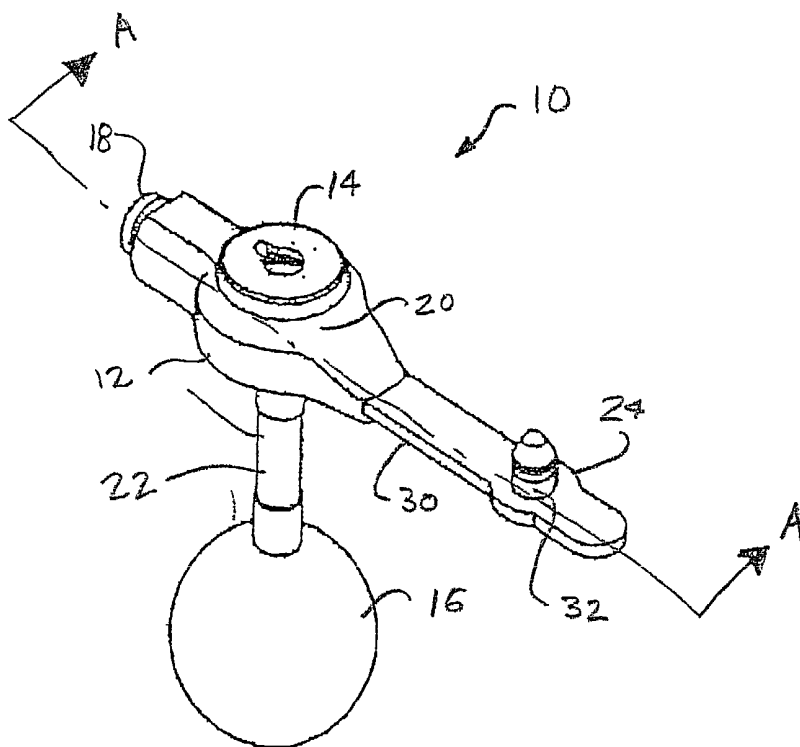
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(54) Title: AN IMPROVED SEALING VALVE ASSEMBLY FOR MEDICAL PRODUCTS



(57) Abstract: A sealing valve assembly is provided for medical products. The valve assembly includes a valve member mountable within a passageway of a medical product body element, the valve member defining a peripheral portion spaced from a central axis and including two walls extending from the peripheral portion toward the central axis, the walls including ends that contact each other to preclude flow through the passageway toward the second end. The valve member further includes at least one stiffening member extending from at least one of the walls to urge the valve member toward the closed position when disposed in the medical product.



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TITLE OF THE INVENTION

AN IMPROVED SEALING VALVE
ASSEMBLY FOR MEDICAL PRODUCTS

BACKGROUND OF THE INVENTION

Various types of valves incorporating sealing devices are known and widely used in the medical field. For example, mechanical sealing valves are required for various types of catheters, lavage devices, and endoscopy systems developed for a wide range of medical purposes. The valve sealing mechanisms typically preclude the flow of substances (gaseous or fluid) through the medical device in one direction, for example from the patient to the outside environment, while permitting the introduction or flow of desired substances (food, medication, etc.) in the other direction, for example into the patient through the medical device. Enteral feeding devices utilizing a gastrostomy catheter ("feeding tube") are examples of conventional medical devices utilizing a sealing valve to prevent gastric fluids, gases, or particles from unintentionally exiting the patient's body via the catheter. U.S. Patent Nos. 5,997,503 and 5,997,546, both owned by Applicants' Assignee and incorporated by reference herein, disclose balloon catheters suitable for use as skin-level gastrostomy catheters for enteral feeding. Various other devices and catheters have also been proposed for gastrostomy feeding and are known to those skilled in the art.

Conventional sealing valves include duckbill valves, flap valves, slit seal valves, etc. Silicone rubber duckbill seals having durometer ratings of about 50 Shore and a wall thickness of about 0.040 inches have been employed in sealing gastrostomy catheters. Such sealing valves are typically kept closed via back pressure present on one side of the valve unless and until the seal is opened from the other side of the valve by insertion of a feeding tube or by a pressure differential across the seal.

Over time, conventional sealing valves may degrade or lose some of their flexibility (i.e., their ability to return to an initial sealing position after deflection) due to repeated or extended periods of opening of the valve. Also, in certain bodily environments, such as the acidic environment of the gastro-intestinal tract, exposure to the bodily fluids or stomach contents may have a corrosive or other negative effect on the sealing valve over time.

Thus, there is a need for an improved medical sealing valve for use in various medical devices, particularly gastrostomy catheter devices.

SUMMARY OF THE INVENTION

Objects and advantages of the invention will be set forth in part in the following description or may be apparent from the description or may be learned through practice of the invention.

According to the invention, an improved sealing valve assembly is provided for use in a wide array of medical products, including catheters, lavage devices, endoscopy systems, etc. The valve assembly according to the invention is not limited in its particular use and may be used in any medical product wherein it is necessary to permit fluid flow through the product in one direction while preventing backflow of fluids through the product in the opposite direction. For example, the valve assembly is particularly useful in a gastrostomy catheter. Accordingly, it should be appreciated that the present invention also includes medical products or devices incorporating the inventive valve assembly.

The valve assembly includes a valve housing defining a passageway therethrough. A valve member seated in the valve

housing within the passageway. The valve member includes a peripheral portion spaced from the central axis of the valve assembly and two walls extending from the peripheral portion towards the central axis. The walls include ends that contact each other to preclude flow through the passageway toward the second end. The valve member further includes at least one stiffening member extending from at least one of the walls to urge the valve member toward the closed position.

The stiffening member may be a fin extending substantially perpendicular to the respective wall from which the stiffening member extends, or it may be a partial conical section. Two stiffening members may also be provided.

The invention will be described in greater detail below with reference to the figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a medical product, in particular a gastrostomy catheter, according to the present invention;

Fig. 2 is a cross-sectional view of the gastrostomy catheter of Fig. 1 taken along line A-A of Fig. 1 particularly illustrating a valve assembly disposed within a catheter body element;

Fig. 3 is an enlarged cross-sectional view of the valve assembly of Fig. 2 taken along line A-A of Fig. 1;

Fig. 4 is a side view of a first embodiment of the valve member of the valve assembly from the perspective taken in Fig. 3;

Fig. 5 is a side view of the valve member of Fig. 4 rotated 90 degrees;

Fig. 6 is a top view of the valve member of Fig. 4;

Fig. 7 is a cross-sectional view of the assembly of Fig. 3 with the end of a feeding tube inserted therein;

Fig. 8 is a bottom perspective view of the valve member of Fig. 5; and

Fig. 9 is a bottom perspective view of a second embodiment of a valve member according to the present invention.

DETAILED DESCRIPTION

Embodiments of the invention will now be described in detail with reference to the examples shown in the figures. Each example is provided by way of explaining the invention, and not as a limitation of the invention. Various modifications and variations can be made in the invention without departing from the scope and spirit of the invention. For example, features illustrated or described with respect to one embodiment may be used in another embodiment to yield still a further embodiment.

In the following description, the improved sealing device is described with reference to a gastrostomy catheter for purposes of explaining and illustrating the sealing valve assembly. This is not meant as a limitation of the invention. It should be appreciated that the improved sealing device according to the present invention has wide application in the medical field and can be used in any medical device that incorporates a seal to prevent the flow of substances in one direction while permitting the flow of substances in the opposite direction.

A gastrostomy catheter 10 is shown in Figs. 1 and 2 as an example of a medical product incorporating the improved sealing device according to the present invention. The use and operation of such gastrostomy catheters is known to those skilled in the art and need not be described in detail herein. Reference is made to U.S. Patent Nos. 5,997,546 and 5,997,503 incorporated herein by reference for a detailed explanation of gastrostomy catheters.

As used herein, the term "distal" refers to the direction of the patient and the term "proximal" refers to the direction of the clinician.

Referring briefly to Figs. 1 and 2, the gastrostomy device 10 includes a catheter body element 12 having a head 20, an elastomeric

sleeve forming a balloon 16, and a catheter segment 22. The catheter segment 22 includes a shaft 23 having a dispensing tip 38 attached to its distal end. A first central opening or port 27 in the head 20 incorporates a valve housing assembly 14 that enables the injection of nutrients, enteral feeding solution, medications, etc., into the patient through the head 20 and into a first lumen 34 of the catheter segment 22. The valve housing assembly 14 includes the improved sealing valve according to the invention, as described in greater detail below. A plug 32 may be provided at the end of a lanyard 30 attached to the catheter head 20. The plug 32 can be inserted into the first port 27 when the port is not being used to administer fluids into the patient.

A second port 29 in the head 20 serves as an opening through which fluid such as air or saline solution may be injected into or removed from the balloon 16 through a second lumen 35 having a distal opening 37. An inflation valve assembly 18 is disposed in the second port 29 for permitting the clinician to control inflation and deflation of the balloon 16, as is understood by those skilled in the art.

The valve housing assembly 14 is shown in greater detail in Fig. 3. The valve housing assembly 14 includes a valve housing 40 and the improved sealing valve member 42. The valve housing 40 has an annular member 44 and a relatively flat cap member 46 connected to the annular member 44, for example by a press-fit or an adhesive. The cap member 46 may have a ridge 48 that fits within a groove 50 in the annular member 44 for securing the two parts together. The valve housing 40 includes a flange 54 that extends into a corresponding groove in the catheter body element 12 to seat and secure the valve housing therein. The flange 54 extends radially from a lower tubular portion 58 of the valve housing 40. The tubular portion 58 may have inner walls that angle towards a centerline axis 69 of the valve housing assembly 14. The walls of the tubular portion 58 parallel to the plane of Fig. 3 may be parallel to the axis 69.

A passage 52 is defined through both portions of the valve housing assembly 14. The passage 52 is in fluid communication with the feeding lumen 34 through the valve member 42 for introducing nutrients, feeding solutions, medication, etc., into the patient's stomach, intestine, or other body cavity. The valve member 42 is disposed within the passage 52 for selectively blocking the fluid path through feeding lumen 34.

The valve member 42 incorporates novel features of the present invention and various embodiments of the valve member 42 are partially shown in Figs. 3-10. Referring to Fig. 3, the valve member 42 includes a proximal flange portion 68 disposed between facing surfaces 64, 66 of the annular member 44 and the cap member 46. Small circular ridges 60, 62 on the facing surfaces 64, 66 engage the flange portion 68 and help to seat and hold the valve member 42 in place. The valve member 42 includes two walls 70, 72 on opposite sides of the central axis 69 that extend from the peripheral portion 68 and are angled towards the central axis 69. The walls 70, 72 meet at a single seal interface 74 defined by ends 76, 78 of the walls. Parts 68, 70, and 72 form what is known in the art as a duckbill valve. As explained in greater detail below, to achieve satisfactory sealing, the thickness and profile of the walls 70, 72 may be designed in various ways according to the present invention depending on the durometer of the material used for the valve member 42.

The seal interface 74 is biased to a closed position and maintained in the closed position by body cavity pressure unless forced open by an object inserted into the valve member 42 through the cap member 46 or by a significant pressure differential between the patient cavity and the external environment. An object useful to open the valve member 42 could be a feeding tube, a feeding tube adapter, or a pressure relief tube. As an example, Fig. 7 shows the valve housing assembly 14 of Fig. 3 with the end of a feeding tube 108 inserted therein. Note that the tube end 108 pushes open the walls 70, 72 of

valve member to allow communication with the patient's body cavity through the valve housing 14 and feeding lumen 34.

The valve member 42 includes at least one stiffening member 80 extending from one of the walls 70 or 72 for urging the valve member toward the sealed position. As shown in Figs. 3-9, the valve member 42 may include two such stiffening members 80, one extending from each wall 70,72. Each stiffening member 80 contacts the inside of the tubular portion 58 of the valve housing 40. In some embodiments, the stiffening members 80 are sized so as to be slightly compressed when inserted into the tubular portion 58 to bias the walls 70,72 together in the sealed position. As shown best in Fig. 8, the stiffening members 80 may comprise fins extending substantially perpendicular to sealing interface 74. It should be understood that stiffening members 80 may have other configurations and shapes according to the present invention, such as circular, square or other types of bars, flared v-shapes, multiple fins, etc.

For example, an alternate embodiment of the valve member 42 is shown in Fig. 9. In this embodiment, the valve member 142 includes a peripheral portion 168 spaced from two walls 170,172 and a sealing interface 174 similar to that of the first embodiment. However, the stiffening members 180 comprise partial substantially conical sections that essentially fill the space within tubular portion 58 of valve housing assembly 14. Such structure provides stronger urging of the valve member 142 toward the sealed position. Further, by essentially filling in the tubular portion 58 with the valve member 142, gastric fluid and solids, as well as fluids to be passed into the patient's body cavity, are prevented from becoming lodged on the walls, which could diminish performance of the walls or stiffening members.

The various components of the valve assembly may be formed from bio-compatible materials such as medical grade silicone. However, the valve member may be made of a liquid injection molding silicone elastomer such as MED-4850 (50 Shore Durometer), available

from NuSil Technology of Carpintera, California. The valve member may be molded, and the sealing interface 74, 174 is created by slitting or cutting apart the walls 70,72 or 170,172 after molding.

It should be appreciated by those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope and spirit of the invention. It is intended that the invention include such modifications and variations as come within the full scope of the appended claims and any equivalents thereof.

WHAT IS CLAIMED IS:

1. A valve assembly for use in a medical product having a fluid path, the valve assembly configured to selectively pass fluids in one direction along the fluid path and to prevent backflow in the opposite direction along the fluid path, the valve assembly comprising:

a valve housing defining an opening having a central axis, the opening extending through the valve housing such that the opening forms part of the fluid path through the medical product;

a valve member disposed within the opening, the valve member having a single seal interface defined by at least two opposing flexible walls biased towards each other to a sealing position, the valve member having a peripheral portion with the opposing flexible walls extending from the peripheral portion toward the central axis, the opposing flexible walls including ends that contact each other along the single seal interface; and

the valve member further comprising at least one stiffening member extending from at least one of the flexible walls and in contact with the valve housing to urge the valve member to its sealed position.

2. The valve assembly as in claim 1, wherein the at least one stiffening member includes a fin extending substantially perpendicular to the respective wall from which the stiffening member extends.

3. The valve assembly as in claim 1, wherein the at least one stiffening member comprises a partial conical section.

4. The valve assembly as in claim 1, further comprising two of the stiffening members, each of the stiffening members extending from a respective one of the flexible walls.

5. The valve assembly as in claim 4, wherein each stiffening member comprises a fin extending substantially perpendicular to the respective wall from which the stiffening member extends.

6. The valve assembly as in claim 4, wherein each stiffening member comprises a partial conical section.

7. The valve assembly as in claim 1, wherein the valve member peripheral portion and walls form a duckbill valve.

8. A medical product defining a fluid path, the medical product comprising a valve assembly disposed in the path, the valve assembly comprising:

a valve housing defining an opening having a central axis, the opening extending through the valve housing such that the opening forms part of the fluid path through the medical product;

a valve member disposed within the opening, the valve member having a single seal interface defined by at least two opposing flexible walls biased towards each other to a sealing position, the valve member having a peripheral portion with the opposing flexible walls extending from the peripheral portion toward the central axis, the opposing flexible walls including ends that contact each other along the single seal interface; and

the valve member further comprising at least one stiffening member extending from at least one of the flexible walls and in contact with the valve housing to urge the valve member to its sealed position.

9. The medical product as in claim 8, wherein the medical product is a gastrostomy catheter.

10. A medical product sealing valve for use in a medical product having a fluid path defined therethrough, the medical product sealing valve configured to selectively pass fluids in one direction along the fluid path and to prevent flow in the opposite direction along the fluid path, the medical product valve comprising:

a flexible valve member configured for placement within the medical product fluid path, the valve member having a single seal interface and being disposed in a closed position unless moved to an opened position, the valve member defining a central axis and including a peripheral portion spaced from the central axis and at least two walls extending from the peripheral portion toward the central axis, the walls including ends that contact each other along the single seal interface to preclude flow from the body cavity through the fluid path when the valve member is in the closed position, the valve member further including at least one stiffening member extending from at least one of the walls to urge the valve member toward the closed position when disposed in the medical product.

11. The medical product sealing valve of claim 10, wherein the at least one stiffening member includes a fin extending substantially perpendicular to the respective wall from which the stiffening member extends.

12. The medical product sealing valve of claim 10, wherein the at least one stiffening member includes a partial conical section.

13. The medical product sealing valve of claim 10, comprising two of the stiffening members, each of the stiffening members extending from a respective one of the walls.

14. The medical product sealing valve of claim 13, wherein each stiffening member includes a fin extending substantially perpendicular to the respective wall from which the stiffening member extends.

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15. The medical product sealing valve of claim 13, wherein each stiffening member includes a partial conical section.

16. The medical product sealing valve of claim 10, wherein the valve member peripheral portion and walls form a duckbill valve.

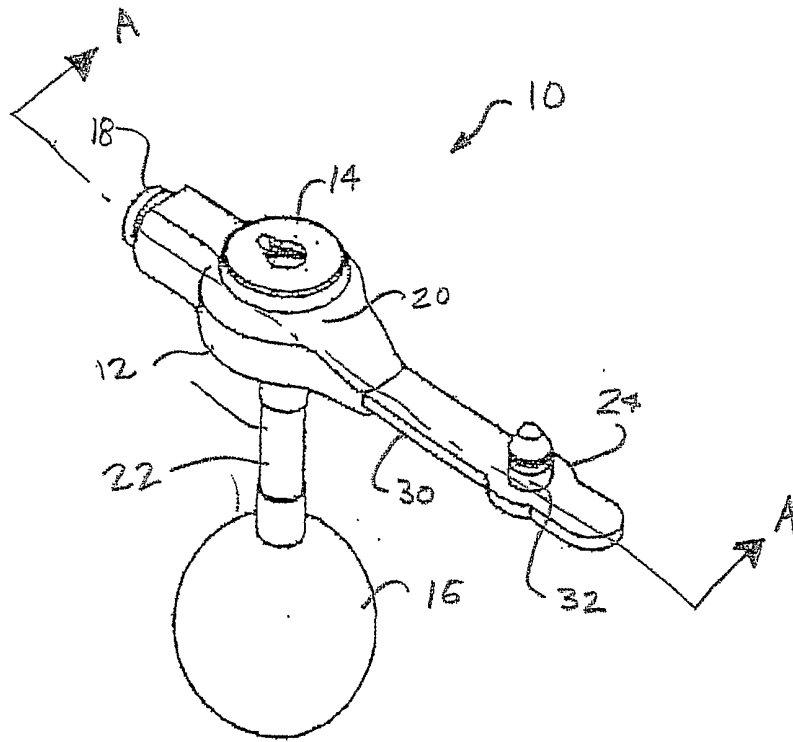


FIG. 1

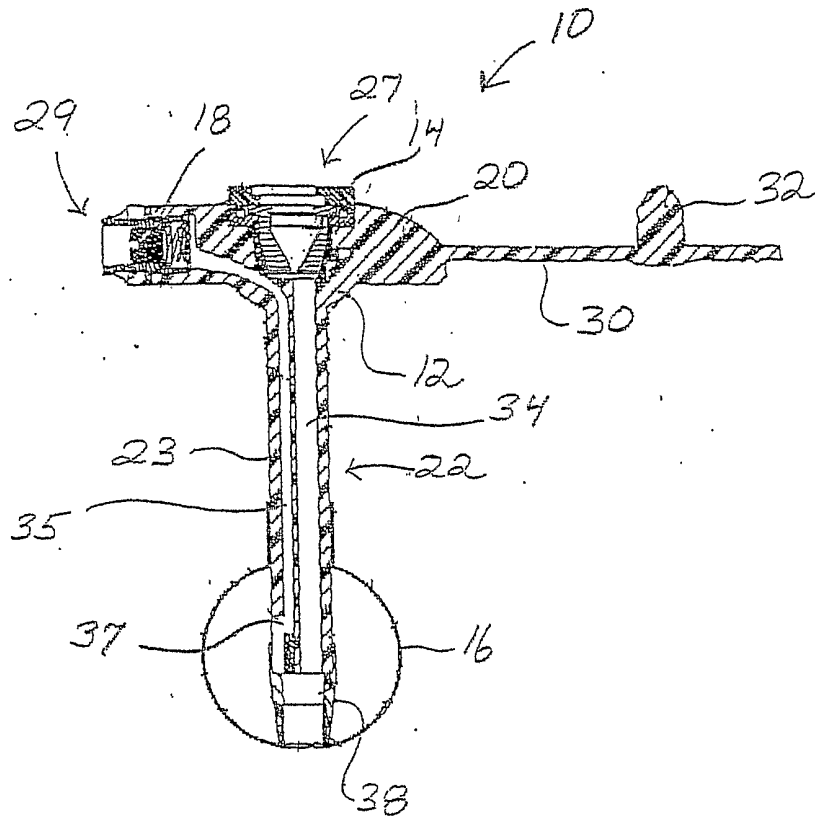


FIG 2

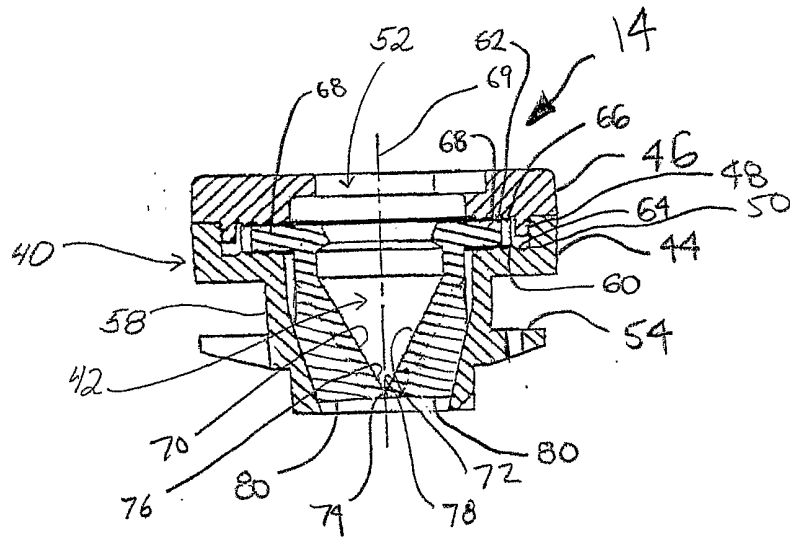


FIG. 5

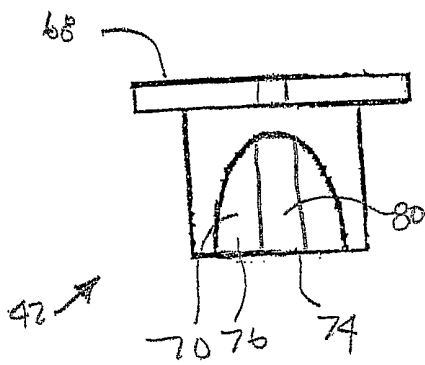


FIG. 4

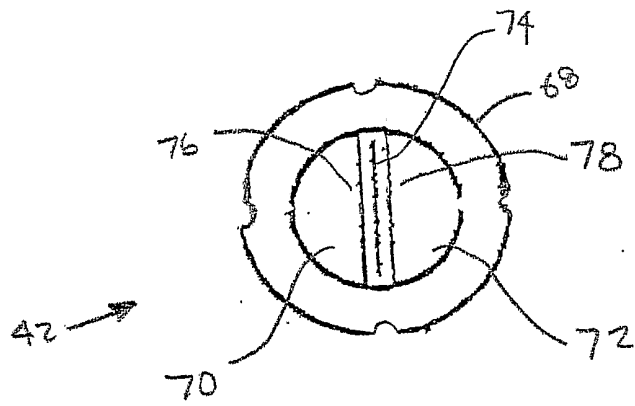
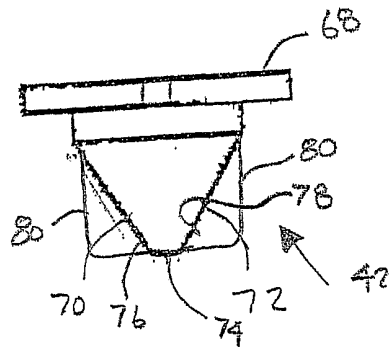


FIG. 6

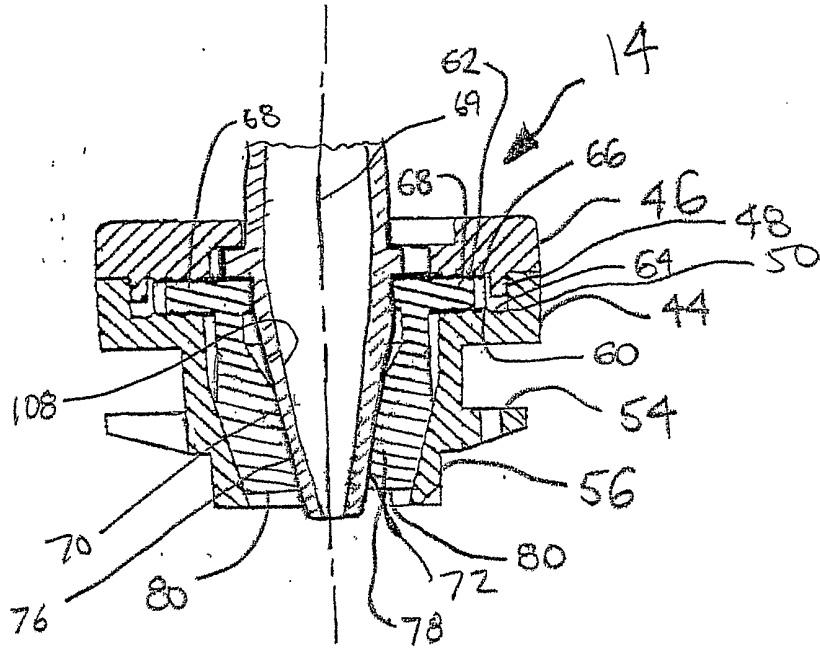


FIG. 7

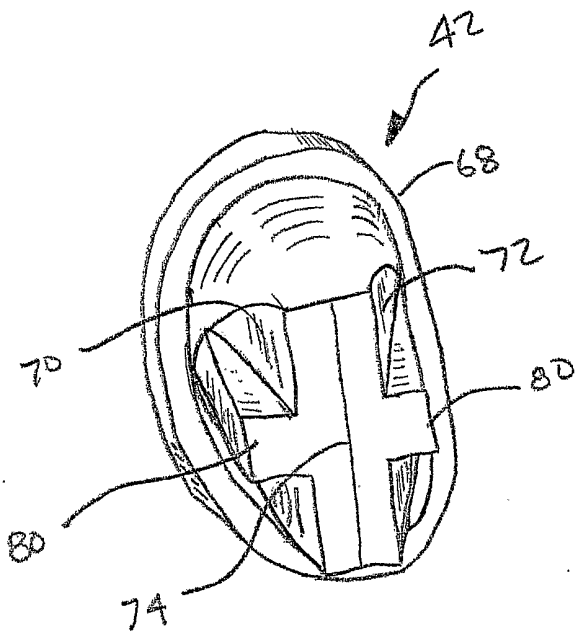


FIG. 8

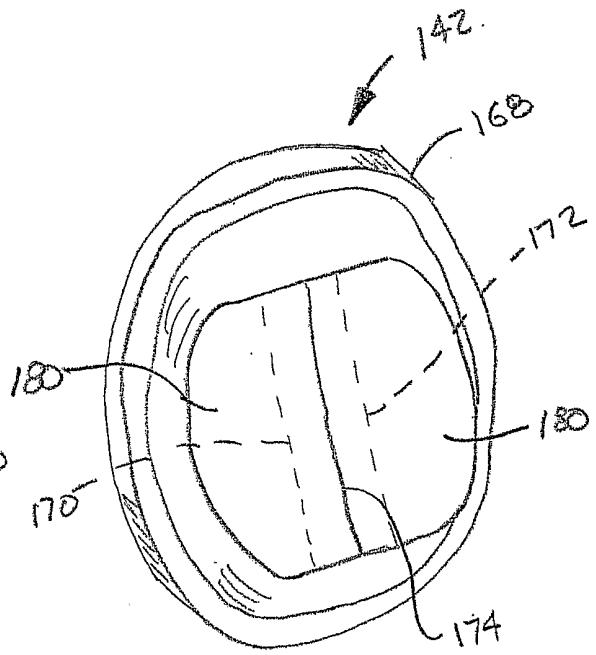


FIG. 9