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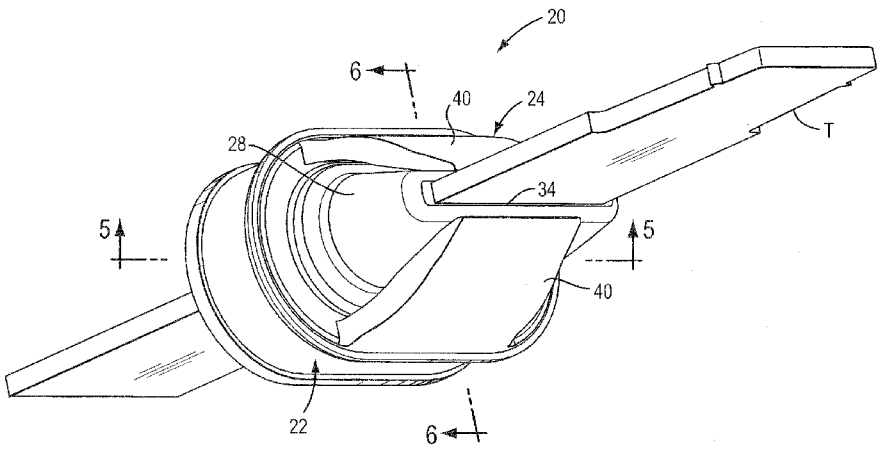


FIG. 4

(57) Abstract: A dispensing assembly (20, 20A, 20B, 20C, 20D) comprises a resiliently flexible valve (22, 22A, 22B, 22C, 22D). The valve includes at least one self-sealing slit (34, 34A, 34B, 34C, 34D) and a plurality of confronting, openable portions (36, 36A, 36B, 36C, 36D) along the at least one slit to define an initially closed dispensing orifice. The dispensing assembly includes a plurality of pressure-applying numbers (36, 36A, 36B, 36C, 36D) respectively applying pressure to the openable portions.

DISPENSING ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATION(S)

Not applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable.

MICROFICHE/COPYRIGHT REFERENCE

Not applicable.

FIELD OF INVENTION

The present invention relates generally to structures for dispensing articles or fluent substances, and more particularly to a dispensing assembly including a resiliently flexible valve, and associated valve retainer, wherein the retainer is configured to apply pressure to portions of the valve to increase the seal created by the valve.

BACKGROUND OF THE INVENTION

There are many applications in which it is desired to dispense articles or fluent substances from an associated container. Heretofore, a wide variety of packages have been provided which include a container and associated dispensing structure, which dispensing structure includes one or more resiliently deformable elastomeric dispensing valves. For example, see U.S. Patents No. 5,271,531, No. 6,112,951, No. 6,230,940, and No. 7,086,575, all of which are hereby incorporated by reference.

Valves of this nature are flexible and resilient, and have one or more self-sealing slits. This type of valve is normally closed, but typically provides dispensing by the creation of a pressure differential across the valve.

One type of valve of this nature is a so-called duckbill valve, which includes a valve head having a generally inwardly tapering configuration, with a single, self-sealing slit at a free end thereof. While this type of valve can be advantageously employed for dispensing

different types of articles and substances, it is recognized that duckbill valves can be subject to low pressure leakage, and may allow ingress of fluid to pass inwardly through the valve structure.

The present invention is directed to a dispensing assembly including a resiliently flexible, self-sealing valve, and an associated valve retainer which is configured to apply pressure to portions of the valve in order to increase the opening resistance of the valve so that the valve forms a tighter seal with the associated container.

BRIEF SUMMARY OF THE INVENTION

In accordance with the present invention, a dispensing assembly which can be used within an associated container, or other fluid or article management system, includes a resiliently flexible valve, and an associated valve retainer which extends generally about the valve. Notably, the valve includes a valve head having a first and second side, and at least one self-sealing slit, with a plurality of confronting, openable portions along the self-sealing slit. The openable portions are moveable generally from a closed configuration to an open configuration to open a dispensing orifice defined by the valve head. In order to increase the opening resistance of the openable portions, the dispensing assembly includes a plurality of pressure-applying members configured to respectively apply pressure to the openable portions of the valve head.

In accordance with the illustrated embodiments, the present dispensing assembly includes a valve including a peripheral attachment portion, and a flexible, resilient valve head joined to the peripheral attachment portion. The valve head has a first side and a second side, and at least one self-sealing slit extending therethrough.

The valve head has a plurality of confronting, openable portions along the at least one slit, to define an initially closed dispensing orifice. The openable portions are moveable generally from a closed configuration to an open configuration to open the dispensing orifice.

The present dispensing assembly further includes a plurality of pressure-applying members operatively associated with the valve for respectively applying pressure to the openable portions of the valve head of the associated valve. Notably, the pressure-applying members act to increase the resistance to opening of the openable portions to the open configuration of the valve. For some applications, the pressure-applying members desirably

act to prevent low pressure leakage out of the valve, and prevent, or at least minimize, reverse flow into the valve.

It is within the purview of the present invention to provide the pressure-applying members on any structure associated with the valve, including a container or like structure. Where the pressure-applying members are part of such a container or like structure, the dispensing assembly of the present invention may be characterized as including the combination of the valve and the structure having such pressure-applying members.

In the illustrated embodiments, the pressure-applying members are provided as part of a valve retainer which extends about the valve, and which functions to attach the valve to an associated container or other fluid management or article management system. The optional provision of the valve retainer in combination with the valve facilitates assembly with an associated container or other structure.

In accordance with one illustrated embodiment, the valve of the dispensing assembly includes an intermediate portion joining the peripheral attachment portion and the valve head. In certain illustrated embodiments, the valve head has a pair of intersecting, self-sealing slits, with four openable portions provided. In these embodiments, the dispensing assembly has four of the pressure-applying members for respectively applying pressure to the openable portions of the valve head.

In one illustrated embodiment, the pressure-applying members respectively apply pressure to the openable portions of the valve head generally at the periphery of the valve head. In alternate embodiments, the pressure-applying members are configured to apply pressure to the openable portions of the valve head at a region spaced from the periphery of the valve head.

In one illustrated embodiment, the valve head has a pair of intersecting, generally inwardly tapering portions, with the pair of self-sealing slits respectively provided at the free edges of the inwardly tapering portions. In an alternative embodiment, the valve head includes a portion that has a generally frustoconical configuration, with the dispensing assembly having four of the pressure-applying members for respectively engaging the openable portions of the valve head.

In a presently preferred embodiment, the valve head has a generally inwardly tapering configuration, with a single, self-sealing slit provided at a free end thereof. In this

embodiment, the associated valve retainer has a pair of the pressure-applying members for respectively engaging the openable portions of the valve head generally at respective opposite sides of the self-sealing slit. In this embodiment, each of the pressure-applying members has a generally elongate configuration, engaging the respective one of the openable portions of the valve head at a region spaced from the periphery of the valve head. Each of the pressure-applying members preferably has a non-linear configuration, and includes an intermediate portion spaced from the valve head in the closed configuration of the valve.

Numerous other advantages and features of the present invention will become readily apparent from the following detailed description of the invention, from the claims, and from the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings that form part of the specification, and in which like numerals are employed to designate like parts throughout the same,

FIG. 1 is an isometric view of a first embodiment of a dispensing assembly of the present invention, shown with an associated container, in a dispensing configuration;

FIG. 2 is a cross-sectional view taken generally along the plane 2-2 of FIG. 1;

FIG. 3 is a cross-sectional view taken generally along the plane 3-3 of FIG. 2;

FIG. 4 is an isometric view of this embodiment of the present dispensing assembly shown prior to installation on the associated container, and illustrating dispensing of an article there through;

FIG. 5 is cross-sectional view taken generally along the plane 5-5 of FIG. 4;

FIG. 6 is a cross-sectional view taken generally along the plane 6-6 of FIG. 4;

FIG. 7 is a further isometric view of the dispensing assembly shown in FIG. 4, taken generally from a rear surface thereof;

FIG. 8 is an isometric view of the present dispensing assembly, taken generally from a forward surface thereof, prior to fitment to an associated container, in a closed, non-dispensing configuration;

FIG. 9 is an isometric view of the present dispensing assembly, taken generally from a rear surface thereof;

FIG. 10 is a cross-sectional view taken along the plane 10-10 of FIG. 8;

FIG. 11 is a cross-sectional view taken generally along the plane 11-11 of FIG. 8;

FIG. 12 is an isometric, exploded view of the present dispensing assembly, taken generally from a forward perspective thereof;

FIG. 13 is an isometric, exploded view of the present dispensing assembly, taken generally from a rear perspective view thereof;

FIG. 14 is a cross-sectional view taken generally along the plane 14-14 of FIG. 12;

FIG. 15 is a cross-sectional view taken generally along the plane 15-15 of FIG. 12;

FIG. 16 is a cross-sectional view taken generally along the plane 16-16 of FIG. 12;

FIG. 17 is a cross-sectional view taken generally along the plane 17-17 of FIG. 12;

FIG. 18 is an isometric view of a further embodiment of the dispensing assembly of the present invention, shown in a non-dispensing closed configuration, prior to installation on an associated container or like structure;

FIG. 19 is an isometric, exploded view of the dispensing assembly as shown in FIG. 18;

FIG. 20 is a cross-sectional view taken generally along plane 20-20 in FIG. 18;

FIG. 21 is an isometric view of a valve of the dispensing assembly shown in FIG. 18;

FIG. 22 is a cross-sectional view taken generally along the plane 22-22 of FIG. 21;

FIG. 23 is a cross-sectional view taken generally along the plane 23-23 of FIG. 21;

FIG. 24 is an isometric view of a further alternative embodiment of the dispensing assembly of the present invention shown in a non-dispensing, closed configuration, prior to installation on an associated container or like structure;

FIG. 25 is an isometric, exploded view of the dispensing assembly as shown in FIG. 24;

FIG. 26 is a cross-sectional view taken generally along the plane 26-26 in FIG. 24;

FIG. 27 is an isometric view of a further alternative embodiment of the dispensing assembly of the present invention, shown in a non-dispensing, closed configuration, prior to installation on an associated container or like structure;

FIG. 28 is an isometric, exploded view of the dispensing assembly as shown in FIG. 27;

FIG. 29 is a cross-sectional view taken generally along the plane 29-29 in FIG. 27;

FIG. 30 is an isometric view of a further alternative embodiment of the dispensing assembly of the present invention, shown in a non-dispensing, closed configuration prior to installation on an associated container or like structure;

FIG. 31 is an isometric, exploded view of the dispensing assembly shown in FIG. 30; and

FIG. 32 is a cross-sectional view taken generally along the plane 32-32 in FIG. 30.

DETAILED DESCRIPTION

While the present invention is susceptible of embodiment in many different forms, the specification and the accompanying drawings disclose only some specific forms as examples of the invention. The invention is not intended to be limited to the embodiments so described, however. The scope of the invention is pointed out in the appended claims.

For ease of description, many of the figures illustrating the invention show a dispensing assembly in a typical "upright" orientation that the dispensing assembly may have when installed on an associated container or like structure in an upright orientation, and terms such as upper, lower, horizontal, etc. are used with reference to this orientation. It will be understood, however, that the dispensing assembly of this invention may be manufactured, stored, transported, used, and sold at an orientation other than the positions described.

The dispensing assembly of this invention is suitable for use with a variety of conventional or special containers or associated structures, including containers having various designs, the details of which, although not illustrated or described, would be apparent to those having skill in the art and an understanding of such containers. The container, per se, as referred to herein forms no part of, and therefore is not intended to limit, the dispensing assembly of the present invention. It will also be understood by those of ordinary skill that novel and non-obvious inventive aspects are embodied in the dispensing assembly alone.

FIGS. 1-17 illustrate a first embodiment of the dispensing assembly of the present invention, which is designated generally by the reference numeral 20. As will be further described, dispensing assembly 20 comprises a resiliently flexible valve 22, and an associated valve retainer 24, with these components facilitating assembly together as a unit, for subsequent use of the dispensing assembly with an associated container or like structure.

FIGS. 1-3 illustrate the dispensing assembly 20 mounted on an associated container 26 which is configured to dispense individual medical test strips T through the dispensing assembly. The mechanism in the container for moving the strip T from the container 26 through the dispensing assembly 20 is not shown, and such a mechanism forms no part of the present invention.

The illustrated form of the dispensing assembly 20, including valve 22, is adapted to be used with a container or like structure having an opening to provide access to the container interior and a product contained therein. The dispensing assembly 20 can be used to dispense articles (e.g., test strip T) and also substances, including, but not limited to, relatively low or high viscosity liquids, creams, gels, suspensions, mixtures, lotions, etc. (such as a material constituting a food product, a beverage product, a personal care product, an industrial or household cleaning product, or other compositions of matter (e.g., compositions for use in activities involving manufacturing, commercial or household maintenance, construction, agricultural, medical treatment, military operations, medical devices, drug-delivery systems, drug therapy applications, enteral feeding, gravity-fed systems, and beverage dispensers, etc.)).

In some applications, it may be desirable to employ a generally rigid container. In this regard, the illustrated container 26 may be of a generally rigid construction, and configured such that test strips T are individually positioned generally within, and dispensed by, dispensing assembly 20. The container per se forms no part of the present invention.

As illustrated, the resiliently flexible valve 22 may be characterized as having a number of portions that include at least two basic portions: (1) a dispensing valve head 28 and (2) a peripheral attachment portion 30. The valve 22 is preferably molded as a unitary structure from material which is preferably flexible, pliable, elastic, and resilient. This can include elastomers such as synthetic, thermosetting polymers, including silicone rubber, such as silicone rubber sold in the United States of America by Dow Corning Corp. and Wacker Silicone Company. The valve 22 can be molded from thermosetting materials or from elastomeric materials, or from thermoplastic polymers or thermoplastic elastomers, including those based upon materials such as thermoplastic polypropylene, ethylene, urethane, and styrene, including halogenated counterparts.

With further reference to FIGS. 1-17, and particular reference to FIGS. 14-15, the configuration of the illustrated valve 22 will be described. This type of valve is sometimes referred to as having a duckbill configuration, by virtue of the valve head 28 having a generally inwardly tapering configuration. In accordance with the illustrated embodiment, the valve 22 includes an intermediate portion 32 extending inwardly of peripheral attachment portion 30, with the flexible, resilient valve head 28 extending from the intermediate portion 32. The valve head has a first side and a second side, and a single, self-sealing slit extending through the valve head, with a pair of confronting, openable portions 36 provided along respective opposite sides of the self-sealing slit 34 to define an initially closed dispensing orifice of the valve (e.g., FIG. 12). The openable portions 36 are moveable generally from a closed configuration to an open configuration (e.g., FIGS. 1-7) to open the dispensing orifice of the valve.

The intermediate portion 32 of the valve 20 defines a substantially continuous shoulder 38 (FIGS. 13-15) adjacent the periphery of the valve head 28. As will be further described, this shoulder cooperates with the pressure-applying members of the associated valve retainer 24 to maintain the components of the assembly in an assembled condition for cooperation together.

In this embodiment of the present dispensing assembly, the design takes advantage of the straight, self-sealing slit 34 typically provided in this style of duckbill valve. However, this style of valve typically exhibits low pressure leakage, and may allow water vapor to enter into the associated container through the dispensing assembly (in typical applications, pressures are virtually equal from outside to inside of the dispensing assembly). In order to limit such low pressure leakage, the retainer 24 of the dispensing assembly has been specifically configured to apply pressure to the valve head 28 of the valve 22 in order to enhance the seal typically provided by the valve structure. When an article such as test strip T is being dispensed, the pressure applying members of the retainer can deflect outwardly allowing the strip to pass through the self-sealing slit 34, yet act to minimize and prevent the outside environment from entering into the associated container through the dispensing assembly.

To this end, the retainer 24 extending about the valve 22 includes a pair of pressure-applying members 40 (FIGS. 11) respectively engaging the openable portions 36 of the valve

head 28 of the valve 22. As illustrated, the pressure applying members 40 have a generally elongate configuration, with the pressure-applying members of this embodiment of the present invention decreasing in thickness in a direction toward a free end thereof.

As illustrated, each of the pressure-applying members 40 is configured to engage a respective one of the openable portions 36 at a region spaced from a periphery of the valve head. Each of the pressure-applying members 36 has a non-linear configuration, including an intermediate portion spaced from the valve head in the closed configuration of the valve. As illustrated, each of the pressure-applying members 36 is configured for engagement with the annular shoulder 38 of the valve 22. The pressure-applying members 40 act to increase the resistance to opening of the openable portions 36 of the valve to the open configuration thereof.

One desirable aspect of the present dispensing assembly is its preferred arrangement whereby the valve and retainer of the assembly can be pre-assembled, as a unit, for storage and/or shipment, and for subsequent attachment and mounting on an associated container such as 26. To this end, the valve and retainer are configured for cooperation to maintain them in an assembled state. In particular, the retainer 24 defines a peripheral abutment portion 42 (FIG. 11) for engagement with, and disposition generally between, attachment portion 30 of valve 22, and the shoulder 38 of the valve to thereby maintain the valve and retainer in an assembled condition. In the preferred form, the abutment portion 42 defines a peripheral retention bead 44 (FIG. 10) configured for inter engagement with and retention by a suitable bead 46 on the container 26 (see FIG. 3). The retainer preferably further includes a pair of positioning flanges 48 (FIG. 13) which extend generally between the pair of pressure-applying members 36 for engagement with the attachment portion 30 of the valve 22 (see FIG. 10).

As illustrated in FIG. 3, it will be observed that the dispensing assembly 20, including the valve 22 and retainer 24, can fit within part of the container 26, and be held in generally captive relationship therein by the cooperation of retention bead 44 with the bead 46 on the container. Articles, such as exemplary test strips T, can thereby be dispensed through the dispensing orifice of the dispensing assembly 20, with the pressure applying members 26 acting to increase the resistance to opening of the openable portions 36 of the valve head 22

of the valve. Other articles that can be dispensed include articles for applications such as noted above.

In accordance with the present invention, the pressure-applying members which co-act with the openable portions of the valve can be provided as part of a structure other than an associated valve retainer. In such an alternative configuration of the present invention, the valve can be used without an associated retainer (e.g., the valve could be directly snap-fit or bonded to the container), and the pressure-applying members could instead provided on another associated structure, such as directly on the container 26.

FIGS. 18-23 illustrate a second embodiment of the dispensing assembly of the present invention designated generally by the reference numeral 20A. While this embodiment, like the previously-described embodiment, includes a valve having a single, self-sealing slit, this embodiment includes a retainer having pressure-applying members which respectively apply pressure to openable portions of the valve head generally at the periphery of the valve head.

As illustrated, the dispensing assembly 20A includes a valve 22A having a circular, disk-like configuration, with the dispensing assembly further including a generally annular valve retainer 24A extending about the valve 22A. The dispensing assembly 20A is configured for fitment to an associated container, not shown.

The valve 22A includes a circular valve head 28A, and a peripheral attachment portion 30A, with an intermediate portion 32A extending inwardly from the attachment portion 30A, with the valve head extending from the intermediate portion. In this embodiment, the valve 22A has a first side and a second side, and defines a single, self-sealing slit 34A through the valve head 28A, with a valve head having a pair of confronting, openable portions 36A along respective opposite sides of the self-sealing slit 34A to define an initially closed dispensing orifice. The openable portions 36A are moveable generally from a closed configuration to an open configuration to open the dispensing orifice of the valve.

Dispensing assembly 20A further includes a valve retainer 24A extending about the valve 22A, with the retainer including a pair of diametrically opposed pressure-applying members 40A for respectively applying pressure to the openable portions 36A of the valve head. The pressure-applying members act to increase the resistance to opening of the openable portions 36A to the open configuration of the valve. In this embodiment, the

pressure-applying members 40A respectively apply pressure to the openable portions 36A of the valve head generally at the periphery of the valve head.

In order to facilitate mounting of the dispensing assembly 20A to an associated container or like structure, the annular retainer 24A includes a peripheral abutment portion 42A configured for cooperative interaction with an associated container for mounting the dispensing assembly in operative association therewith. As in the previous embodiment, the pressure-applying members co-act with the openable portions with the valve head to increase the resistance to opening of the valve structure.

By the illustrated configuration, wherein the valve head 28A has a slightly larger outside diameter than an inside diameter defined by pressure-applying members 40A, the valve is maintained in operative association with the retainer so that these components of the dispensing assembly can be conveniently mounted, as a unit, as on an associated container or like structure.

With reference now to FIGS. 24-26, therein is illustrated a further embodiment of the present invention, which in many respects is like the previously described embodiment. However, this embodiment differs from the previous embodiment in that the valve head of the valve of the dispensing assembly defines a pair of intersecting self-sealing slits, with the valve head defining four confronting opening portions, and the associated valve retainer having four pressure-applying members respectively cooperating with the openable portions of the valve head.

In this embodiment, the dispensing assembly, designated 20B, includes a valve 22B, and an annular valve retainer 24B extending about the valve. The valve 22B includes a disc-like, flexible, resilient valve head 28B that extends from a peripheral attachment portion 30B. In the illustrated embodiment, the valve further includes an intermediate portion 32B extending inwardly from the attachment portion 30B, with the valve head 28B extending from the intermediate portion.

The valve head has a first side and a second side, a pair of intersecting, self-sealing slits 34B to define an initially closed dispensing orifice for the valve. The valve head includes four confronting openable portions 36B along the self-sealing slits 34B. The openable portions 36B are movable generally from a closed configuration to an open configuration to open the dispensing orifice of the valve.

The annular valve retainer 24B has a plurality of pressure-applying members 40B which respectively apply pressure to the openable portions 36B of the valve head 28B. The pressure-applying members thereby act to increase the resistance to opening of the openable portions 36B to an open condition. As in the previous embodiment, the pressure-applying members 40B respectively apply pressure to the openable portions of the valve head generally at the periphery of the valve head 28B.

In either of the two embodiments above shown in FIGS. 18-26, the valve retainer 24A, 24B can be configured to include an outwardly tapered guide surface, such as shown in phantom line in FIG. 26, which extends outwardly from the periphery of the valve head of the associated valve.

FIGS. 27 to 29 illustrate a further embodiment of the dispensing assembly of the present invention, designated generally by the reference numeral 20C. Like the previously-described embodiment, this embodiment of the dispensing assembly of the present invention includes a valve having a pair of intersecting, self-sealing slits defining an initially closed dispensing orifice, with the valve including four openable portions movable generally from a closed configuration to an open configuration to open the dispensing orifice. An associated annular valve retainer includes four pressure-applying members in respective engagement with the openable portions of the valve, which pressure-applying members act to increase the resistance to opening of the openable portions of the valve. In distinction from the previous embodiment, this embodiment of the present dispensing assembly includes a valve having a valve head with a generally frustoconical configuration, with the associated annular valve retainer configured to co-act with the openable portions of the frustoconically shaped valve head.

As illustrated, the dispensing assembly 20C includes a valve 22C, and an annular valve retainer 24C extending around the valve 22C. The valve 22C includes a valve head 28C which extends from a peripheral attachment portion 30C, with an intermediate portion 32C extending inwardly from the attachment portion 30C, and the valve head 28C extending from the intermediate portion 32C.

As noted, the valve head 28C has a generally frustoconical configuration, and has a first side and a second side, and a pair of intersecting self-sealing slits 34C to define an initially closed dispensing orifice of the valve. The valve head 28C has four openable

portions 36C along the self-sealing slits, which openable portions are movable generally from a closed configuration to an open configuration to open the dispensing orifice of the valve.

The associated valve retainer 24C includes a plurality of pressure-applying members 40C for respectively applying pressure to the openable portions 36C of the valve head 28C. In accordance with the present invention, the pressure-applying members 40C act to increase the resistance to opening of the openable portions 36C to the open configuration of the valve.

As will be noted, each pressure-applying member 40C is configured to engage and apply pressure to a respective one of the openable portions 36C at a region spaced from a peripheral portion of the valve head 28C, with each pressure-applying member having an intermediate portion spaced from the valve head 28C.

In this embodiment, the valve retainer 24C has an annular abutment portion 42C which fits generally about the exterior of attachment portion 30C of valve 22C. As in previous embodiments, the valve and retainer of the dispensing assembly are configured for assembly, as a unit, to an associated container or like structure, thereby facilitating convenient use of the assembly.

FIGS. 30-32 illustrate a further embodiment of the present invention, generally designated 20D. As in the two previously-described embodiments, the valve of this embodiment of the present dispensing assembly includes a pair of intersecting, self-sealing slits. In distinction from the previous embodiment, including a valve having a valve head with a generally frustoconical configuration, in this embodiment the valve head has a pair of intersecting, generally inwardly tapering portions, and is sometimes referred to as a "dual duckbill" valve.

As illustrated, the dispensing assembly 20D includes a resiliently flexible valve 22D including a resilient valve head 28D that extends from a peripheral attachment portion 30D, with an intermediate portion 32D extending inwardly of the attachment portion, and the valve head 28D extending from the intermediate portion. In this embodiment, the valve head 28D has a first side and a second side, and a pair of intersecting, self-sealing slits 34D extending through the valve head. Accordingly, the valve head includes four openable portions 36D along the self-sealing slits 34D, to define an initially closed dispensing orifice. The openable portions 36D are movable generally from a closed configuration to an open configuration, to open the dispensing orifice.

In this embodiment, the valve head 28D has a pair of intersecting, generally inwardly tapering portions, with the pair of self-sealing slits 34D respectively provided at the free edges of the inwardly tapering portions which define the openable portions 36D of the valve head.

In this embodiment of the dispensing assembly of the present invention, as in the previously-described embodiment, the valve retainer of the dispensing assembly includes a plurality of pressure-applying members which are configured to engage and apply pressure to the openable portions of the valve head at a region spaced from the periphery of the valve head. In particular, valve retainer 24D includes a plurality of pressure-applying members 40D configured to respectively engage and apply pressure to the openable portions 36D of the valve head 28D. Notably, each of the pressure-applying members 40D has a bifurcated configuration for engagement with the respective openable portion 36D at a pair of laterally spaced regions of the respective openable portion. The valve retainer 24D includes an annular abutment portion 42D which fits generally about the peripheral attachment portion 30D of the valve 22D, with the abutment portion 42D facilitating mounting of the dispensing assembly on an associated container or like structure. As in the previous embodiment, this configuration of the dispensing assembly facilitates dispensing of articles which may be circular, rod-like, generally flat, or otherwise configured. This embodiment may also be used to dispense an article that has a cross-shaped configuration. Like the previously described embodiments, this embodiment may also be used to dispense fluent substances.

It will be readily apparent from the foregoing detailed description of the invention and the illustrations thereof that numerous variations and modifications may be effected without departing from the true spirit and scope of the novel concepts or principles of the invention.

WHAT IS CLAIMED IS:

1. A dispensing assembly (20, 20A, 20B, 20C, 20D), comprising:

a valve (22, 22A, 22B, 22C, 22D) including a peripheral attachment portion (30, 30A, 30B, 30C, 30D), and a flexible, resilient valve head (23, 23A, 23B, 23C, 23D) joined to said peripheral attachment portion, said valve head having a first side and a second side, and at least one self-sealing slit (34, 34A, 34B, 34C, 34D) through said valve head, said valve head having a plurality of confronting, openable portions (36, 36A, 36B, 36C, 36D) along said at least one slit, to define an initially closed dispensing orifice, said openable portions being moveable generally from a closed configuration to an open configuration to open said dispensing orifice; and

a plurality of pressure-applying members (40, 40A, 40B, 40C, 40D) respectively applying pressure to said openable portions of said valve head of said valve, said pressure-applying members acting to increase the resistance to opening of said openable portions to said open configuration.

2. A dispensing assembly in accordance with claim 1, including

a valve retainer (24, 24A, 24B, 24C, 24D) extending about said valve,

said valve retainer including said plurality of pressure-applying members (40, 40A, 40B, 40C, 40D).

3. A dispensing assembly (20, 20A, 20B, 20C, 20D) in accordance with claim 1, wherein

said valve (22, 22A, 22B, 22C, 22D) includes an intermediate portion (32, 32A, 32B, 32C, 32D) joining said peripheral attachment portion and said valve head.

4. A dispensing assembly (20B, 20C, 20D)in accordance with claim 1, wherein

said valve head has a pair of intersecting, self-sealing slits (34B, 34C, 34D), and four openable portions (36B, 36C, 36D), said dispensing assembly having four of said pressure-applying members (40B, 40C, 40D) respectively applying pressure to said openable portions of said valve head.

5. A dispensing assembly (20A, 20B) in accordance with claim 4, wherein

said pressure-applying members (40A, 40B)respectively apply pressure to said openable portions (36A, 36B) of said valve head generally at the periphery of said valve head.

6. A dispensing assembly (20D) in accordance with claim 4, wherein

said valve head (28D) has a pair of intersecting, generally inwardly tapering portions, with said pair of intersecting self-sealing slits (34D)respectively provided at the free edges of said inwardly tapering portions.

7. A dispensing assembly (20D) in accordance with claim 6, wherein

each of said pressure-applying members (40D) has a bifurcated configuration for engagement with the respective openable portion (36D) of said valve head (28D) at a pair of laterally spaced regions of the respective openable portion.

8. A dispensing assembly (20C) in accordance with claim 4, wherein

said valve head (28C) includes a portion that has a generally frustoconical configuration, said retainer (24C) having four of said pressure-applying members (40C) respectively engaging said openable portions.

9. A dispensing assembly (20C) in accordance with claim 8, wherein

each of said pressure-applying members (40C) of said retainer has a generally elongate configuration and respectively engage said openable portions (34C) of said valve head (23C) at a region spaced from a periphery of said valve head.

10. A dispensing assembly (20, 20C, 20D) in accordance with claim 1, wherein

each of said pressure-applying members (40, 40C, 40D) respectively engage openable portions (36, 36C, 36D) of said valve head at a region spaced from a periphery of said valve head.

11. A dispensing assembly (20, 20C, 20D) in accordance with claim 10, wherein

each of said pressure-applying members (40, 40C, 40D) has an intermediate portion spaced from said valve head when said openable portions are in said closed configuration.

12. A dispensing assembly (20C) in accordance with claim 11, wherein

said valve head (28C) includes a portion that has a generally frusto-conical configuration, said valve head has a pair of intersecting, self-sealing slits (34C), and four openable portions (36C), said dispensing assembly (20C) having four of said elongate pressure-applying members (40C) respectively engaging said openable portions.

13. A dispensing assembly (20D) in accordance with claim 11, wherein

said valve head (28D) has a pair of intersecting, generally inwardly tapering portions, with said pair of intersecting self-sealing slits (34D) respectively provided at the free edges of said inwardly tapering portions.

14. A dispensing assembly (20) in accordance with claim 11, wherein

said valve head (28) has a generally inwardly tapering configuration, and has a single, self-sealing slit (34) at a free end thereof, said dispensing assembly (20) having a pair of said pressure-applying members (40) for respectively engaging said openable portions generally at respective opposite sides of said self-sealing slit.

15. A dispensing assembly (20A) in accordance with claim 1, wherein

said valve head (28A) has a single self-sealing slit (34A), and a pair of openable portions, said dispensing assembly (20) having a diametrically opposed pair of said pressure-applying members (40A), wherein said pressure-applying members respectively apply pressure to said openable portions of said valve head generally at the periphery of said valve head.

16. A dispensing assembly (20), comprising:

a valve (22) including a peripheral attachment portion (30), an intermediate portion (32) extending inwardly of said peripheral attachment portion, and a flexible, resilient valve head (28) that extends from said intermediate portion (32), said valve head (28) having a first

side and a second side, and a self-sealing slit (34) through said valve head, said valve head (29) having a generally inwardly tapering, duckbill configuration, including a pair of confronting, openable portions (36) along respective opposite sides of said self-sealing slit (34) to define an initially closed dispensing orifice, said openable portions being moveable generally from a closed configuration to an open configuration to open said dispensing orifice; and

a valve retainer (24) extending about said valve, said retainer (24) including a pair of pressure-applying members (40) respectively engaging said openable portions (36) of said valve head (28) of said valve, said pressure-applying members (40) acting to increase the resistance to opening of said openable portions to said open configuration,

each of said pressure-applying members (40) having a generally elongate configuration, and engaging the respective one of said openable portions (36) at a region spaced from a periphery of said valve head (29), each of said pressure-applying members (40) having a non-linear configuration and including an intermediate portion spaced from said valve head (28) in the closed configuration of said valve.

17. A dispensing assembly (20) in accordance with claim 16, wherein

said intermediate portion (32) of said valve defines a shoulder (39) adjacent said periphery of said valve head, each of said pressure-applying members (40) being in engagement with said shoulder of said intermediate portion.

18. A dispensing assembly (20) in accordance with claim 17, wherein

said retainer (24) defines an abutment portion (42) in engagement with said attachment portion (30) and said shoulder (39) of said valve to maintain said valve (22) and said retainer (24) in an assembled condition, said abutment portion (42) defining a peripheral retention bead (44) engageable with an associated container (26) for mounting said dispensing assembly on the container.

19. A dispensing assembly (20) in accordance with claim 17, wherein

said retainer (24) includes a pair of positioning flanges (48) extending from said abutment portion (42), each of said flanges respectively extending generally between said

pair of said pressure-applying members (40) for engagement with said attachment portion (30) of said valve (22).

20. A dispensing assembly (20) in accordance with claim17, wherein

each of said pressure-applying members (40) decreases in thickness in a direction toward a free end thereof.

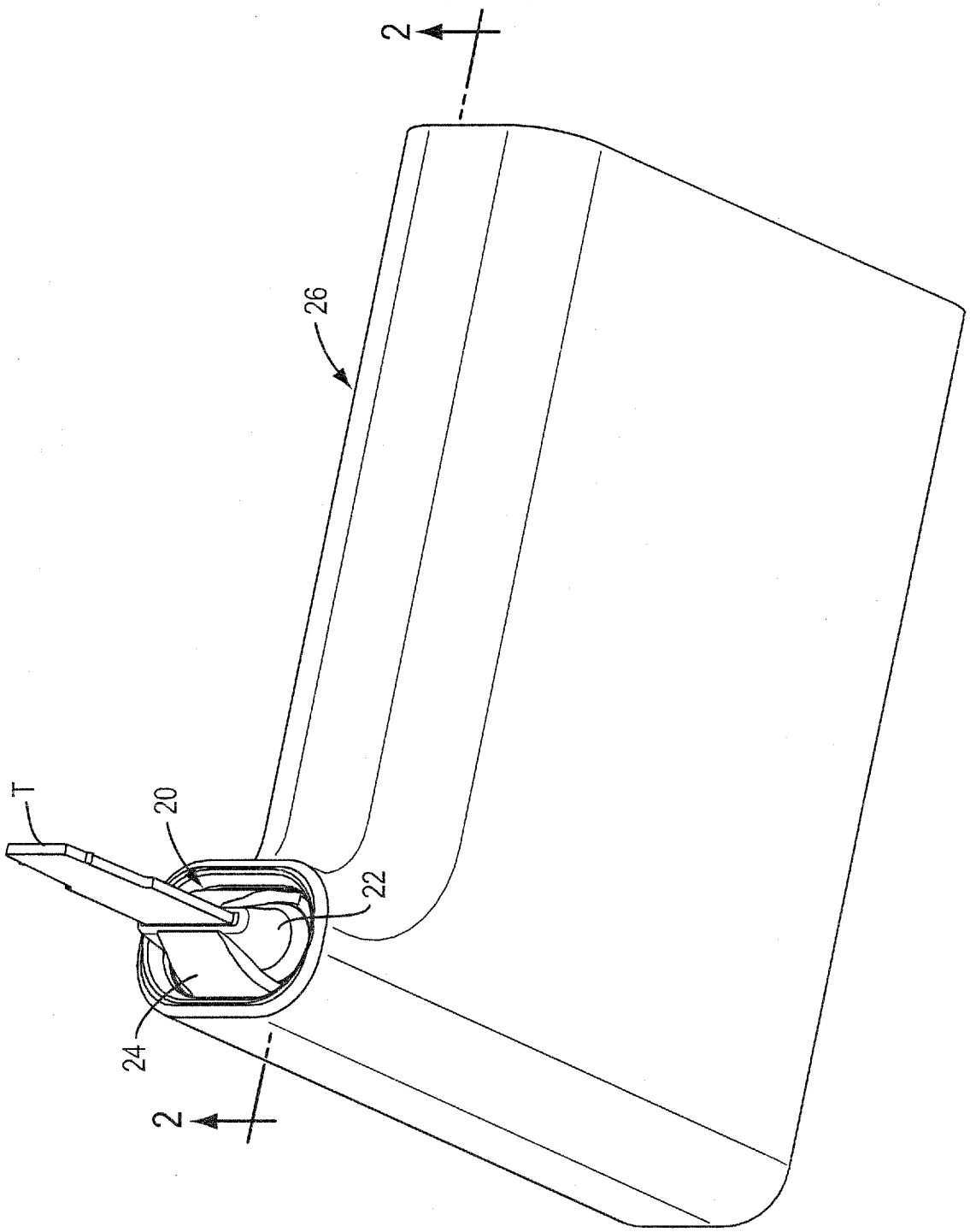


FIG. 1

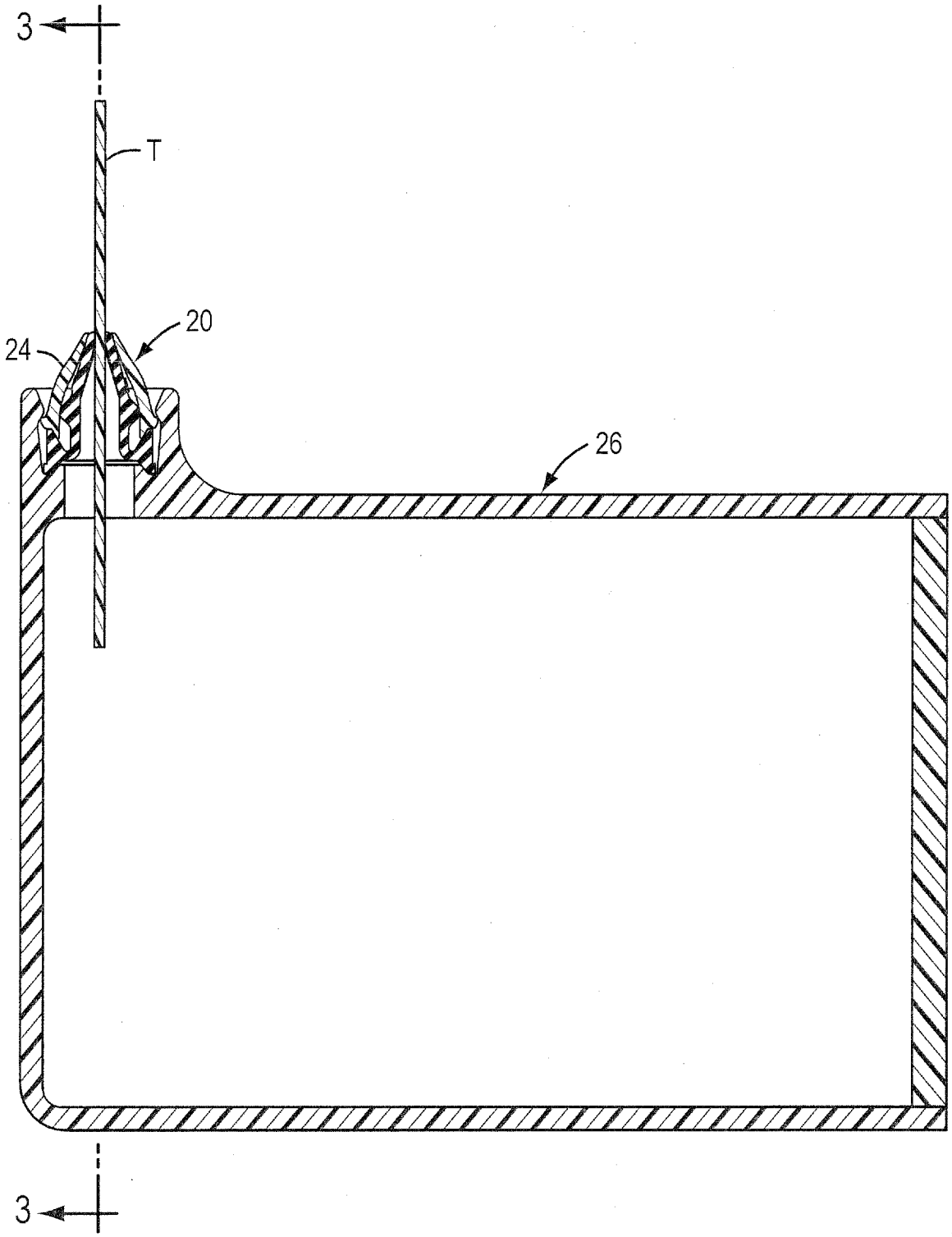
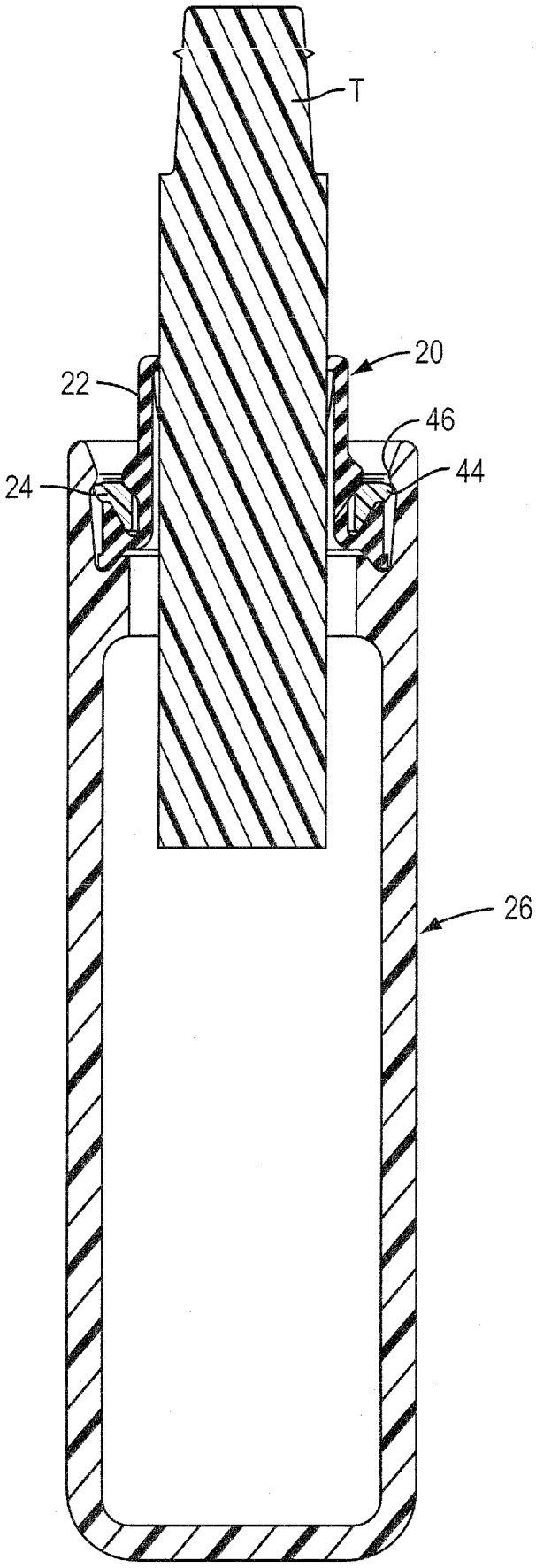


FIG. 2

FIG. 3



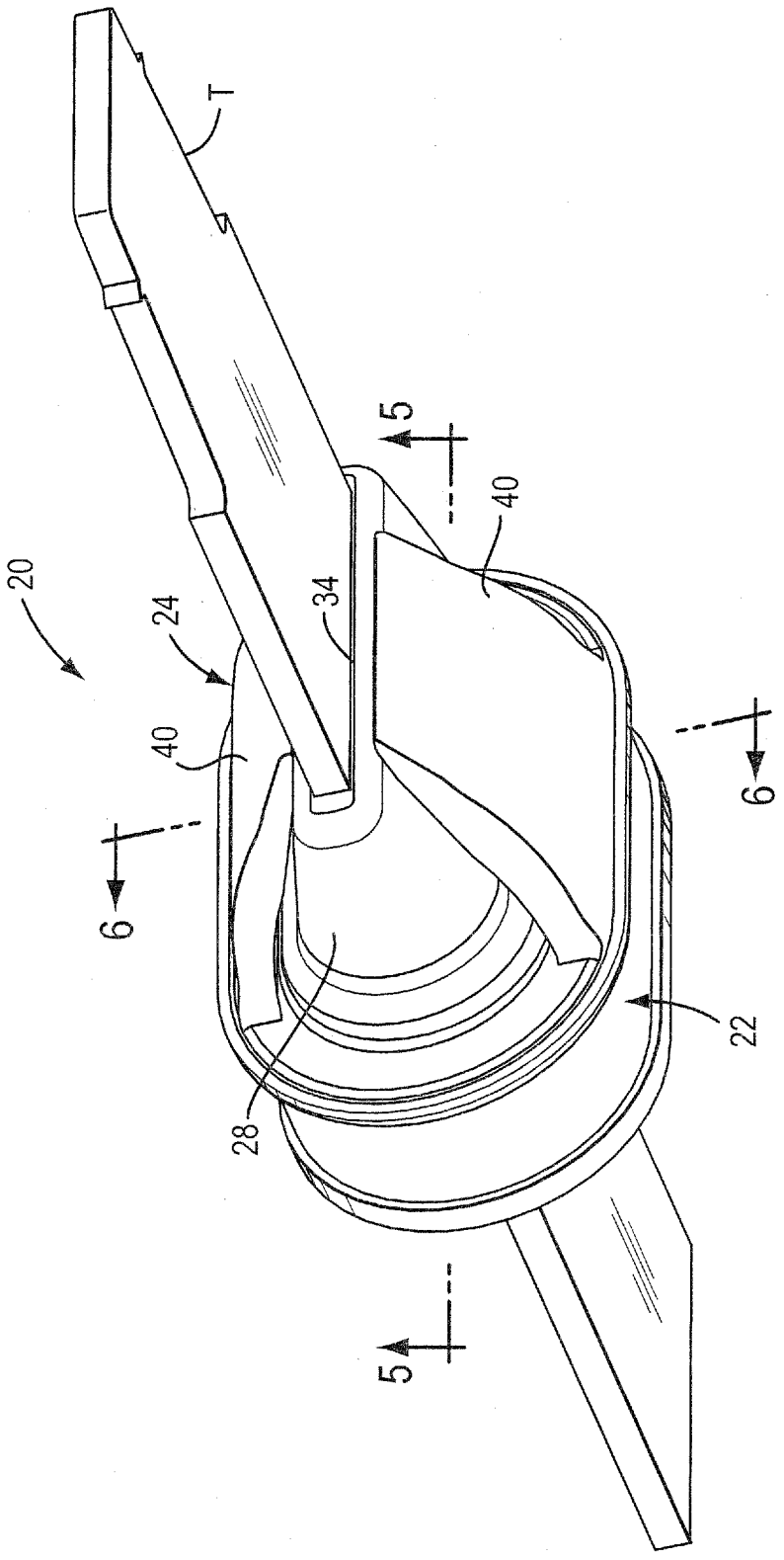


FIG. 4

FIG. 5

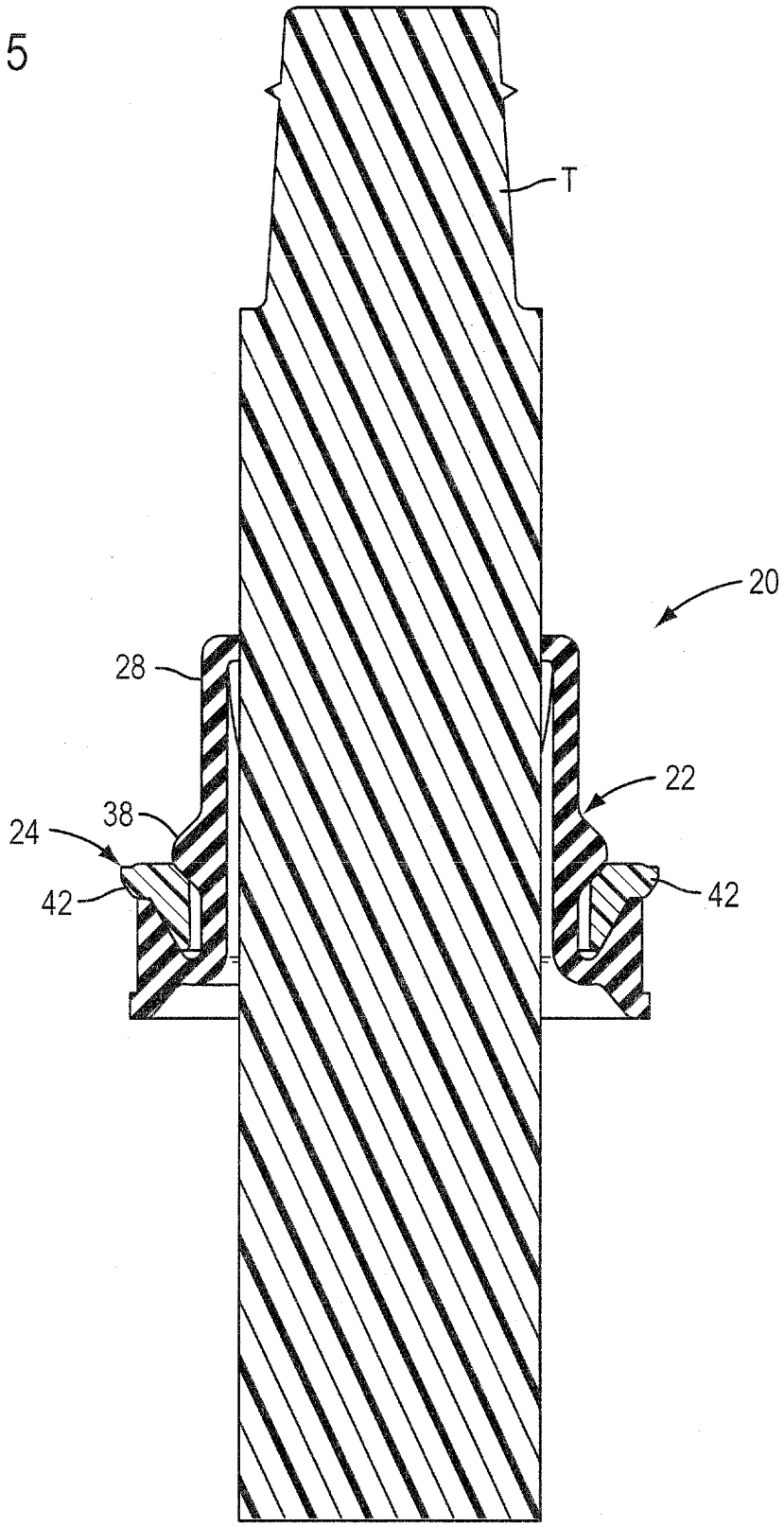
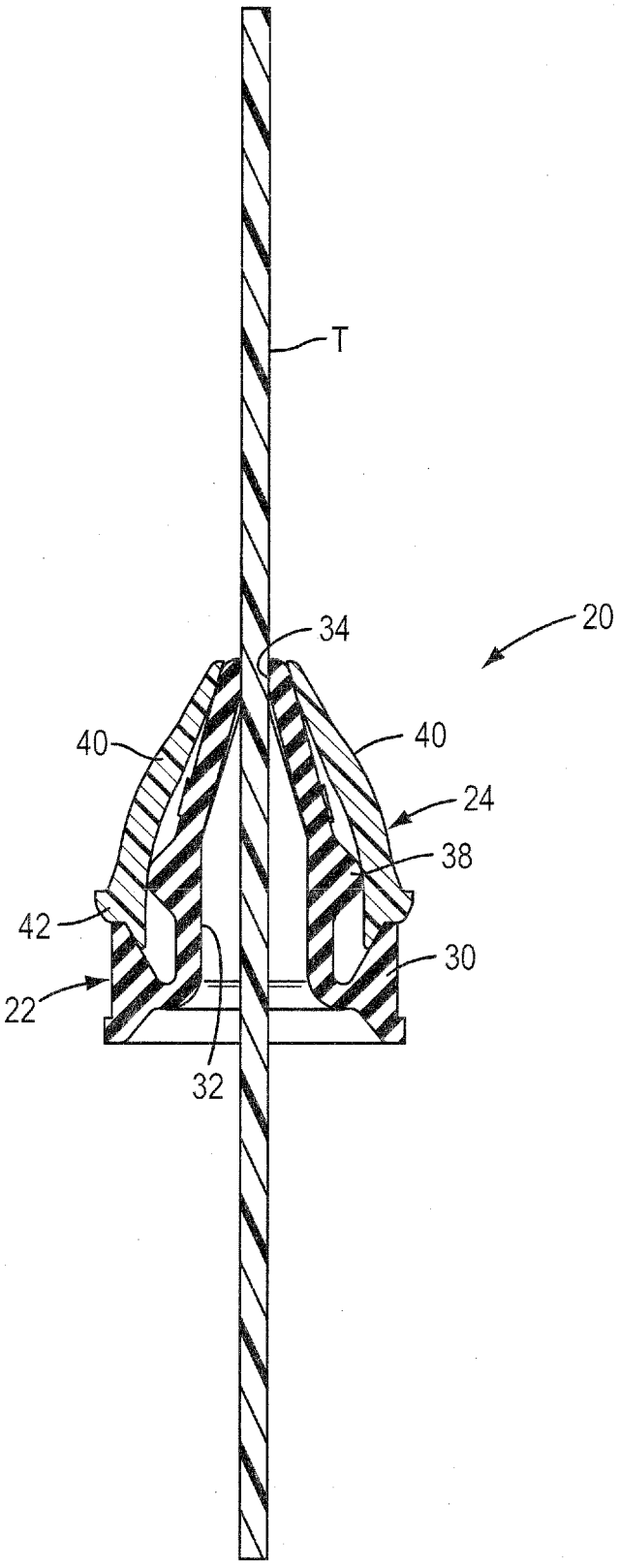


FIG. 6



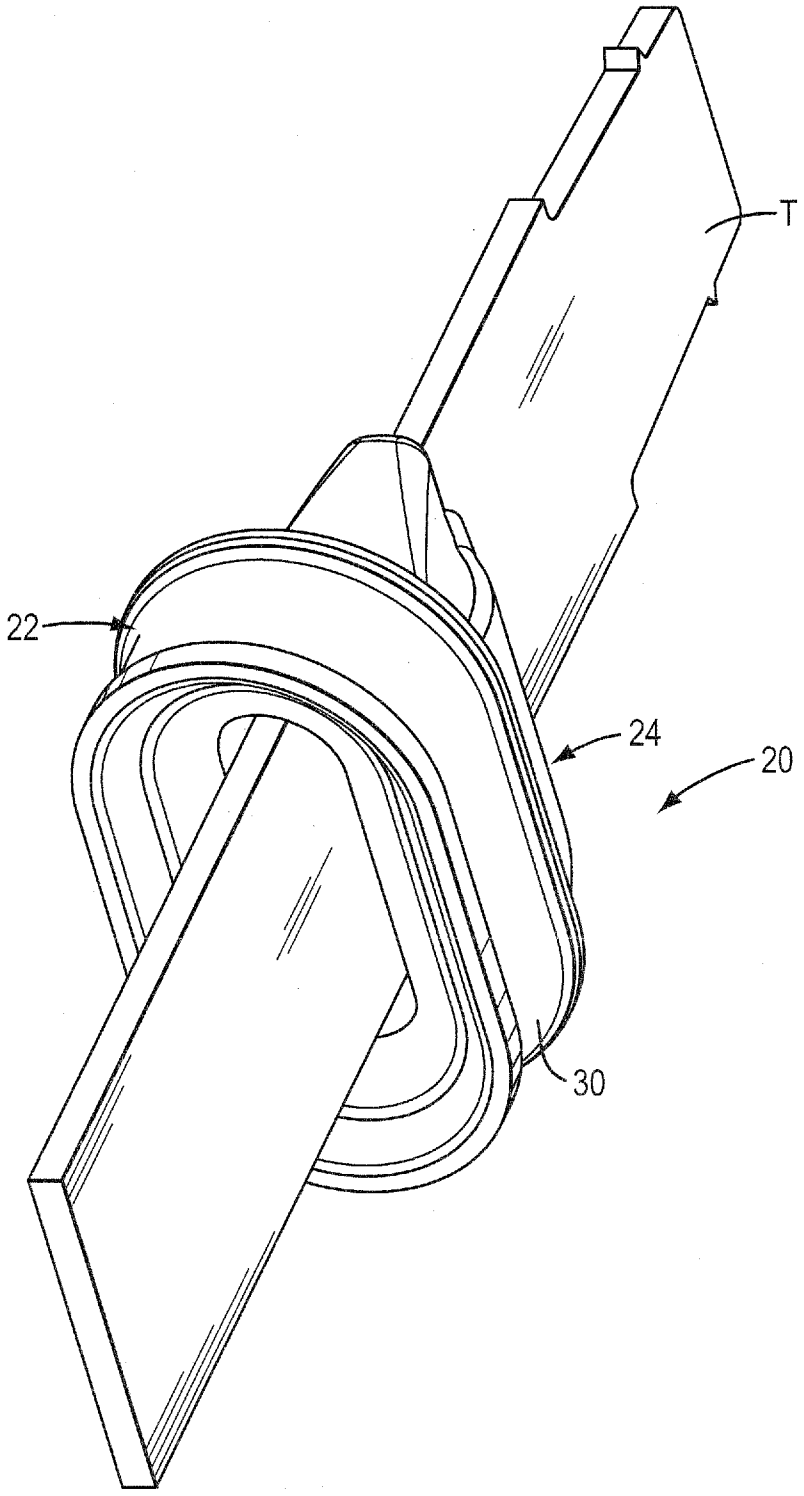


FIG. 7

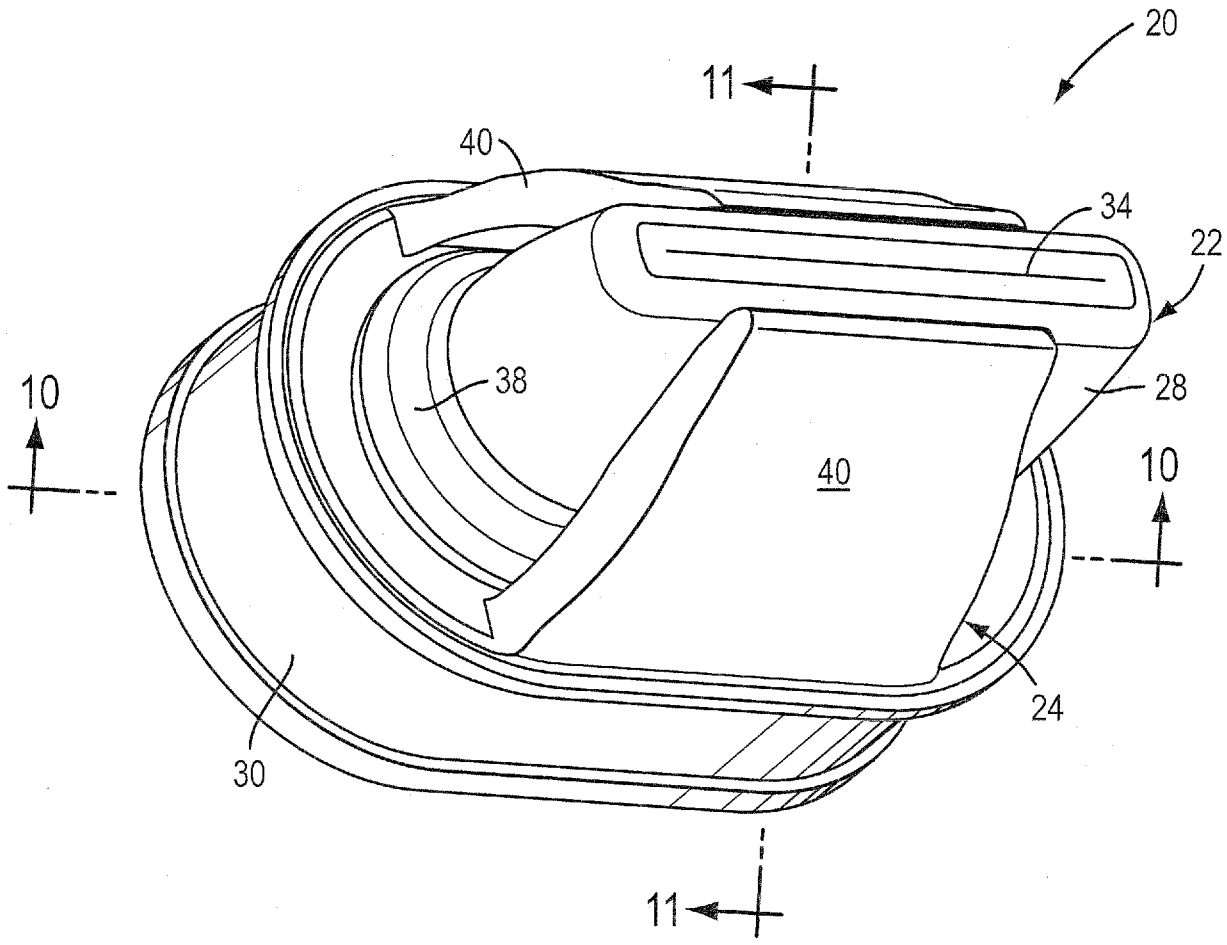


FIG. 8

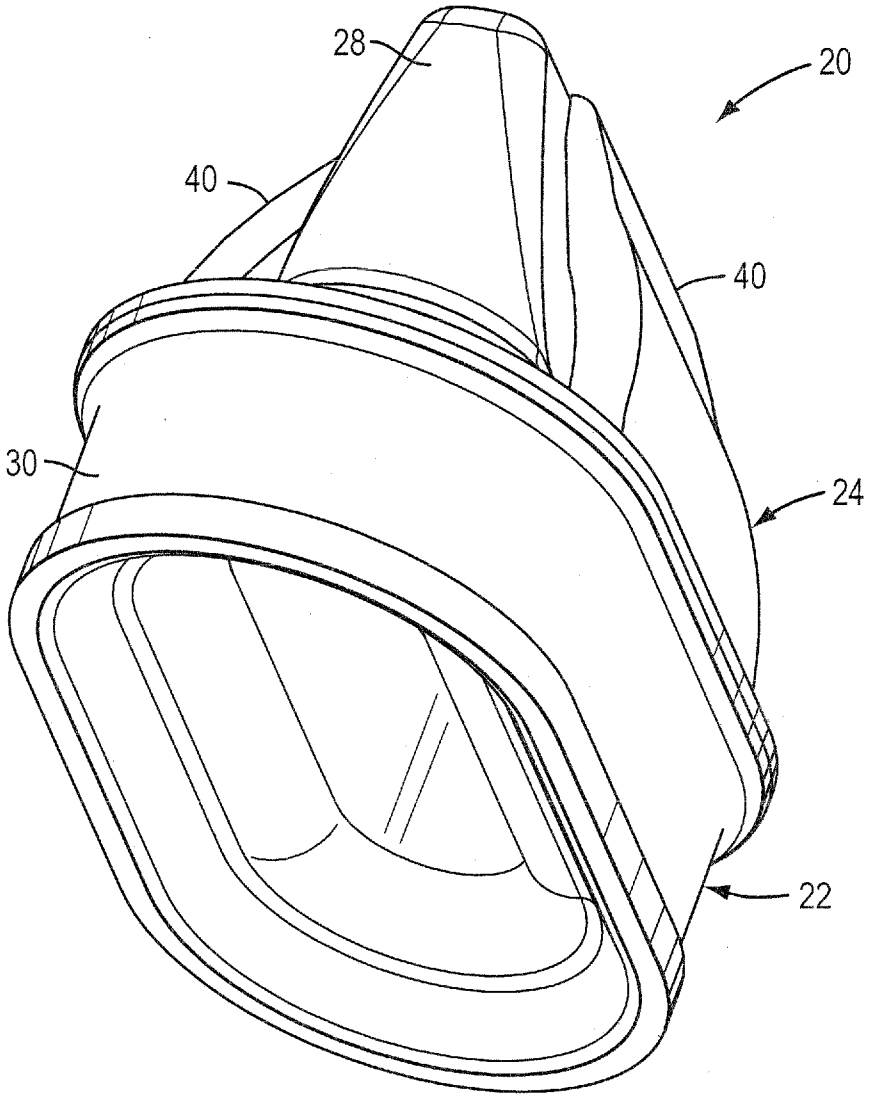


FIG. 9

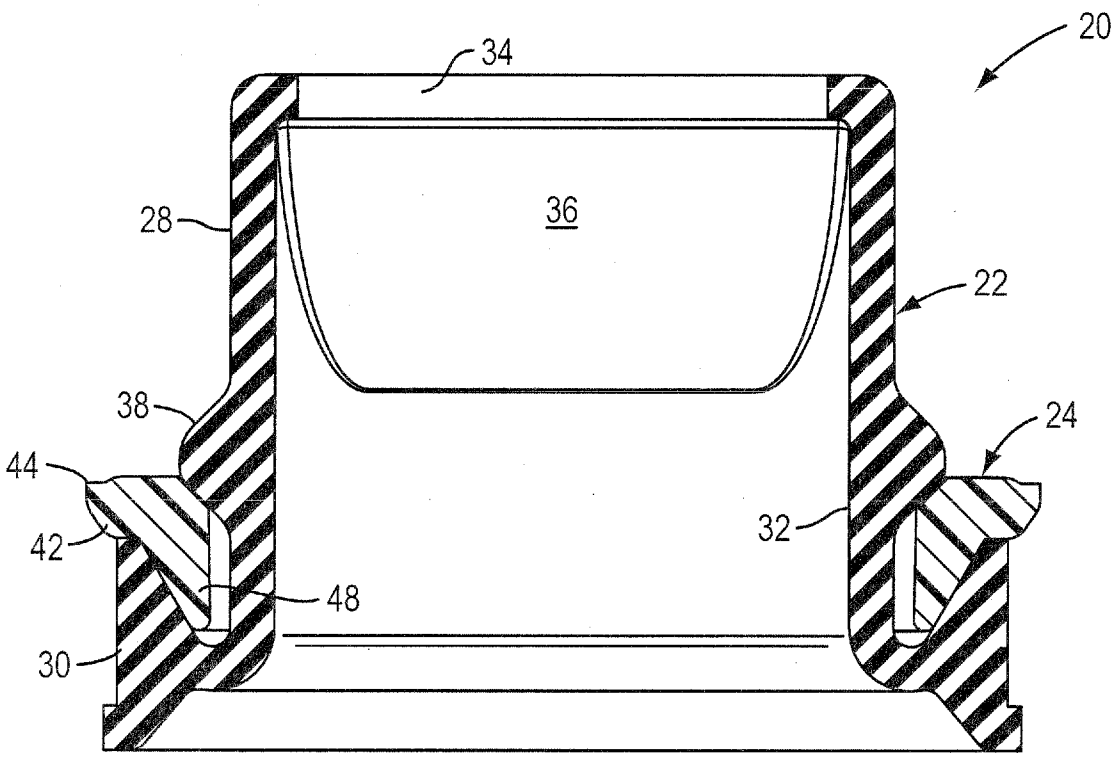


FIG. 10

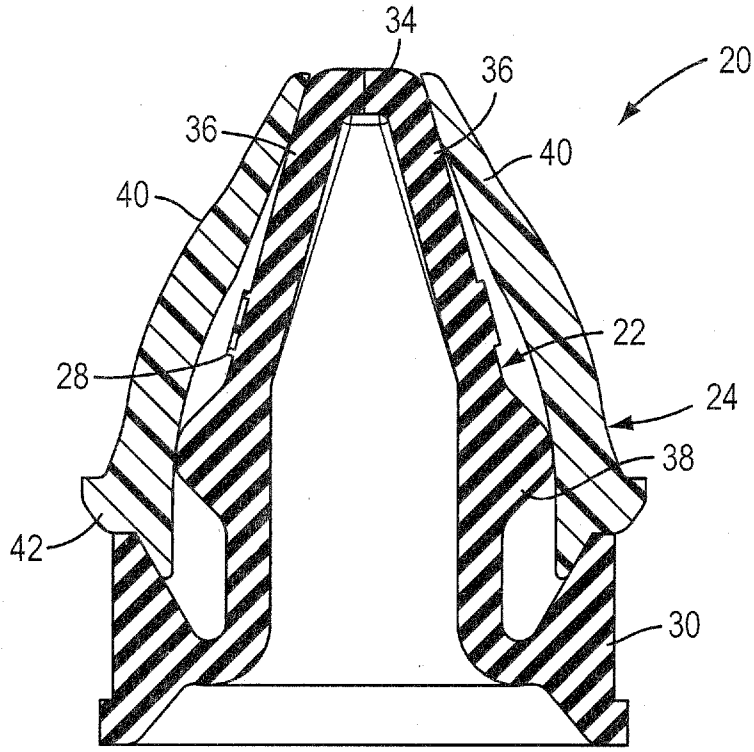


FIG. 11

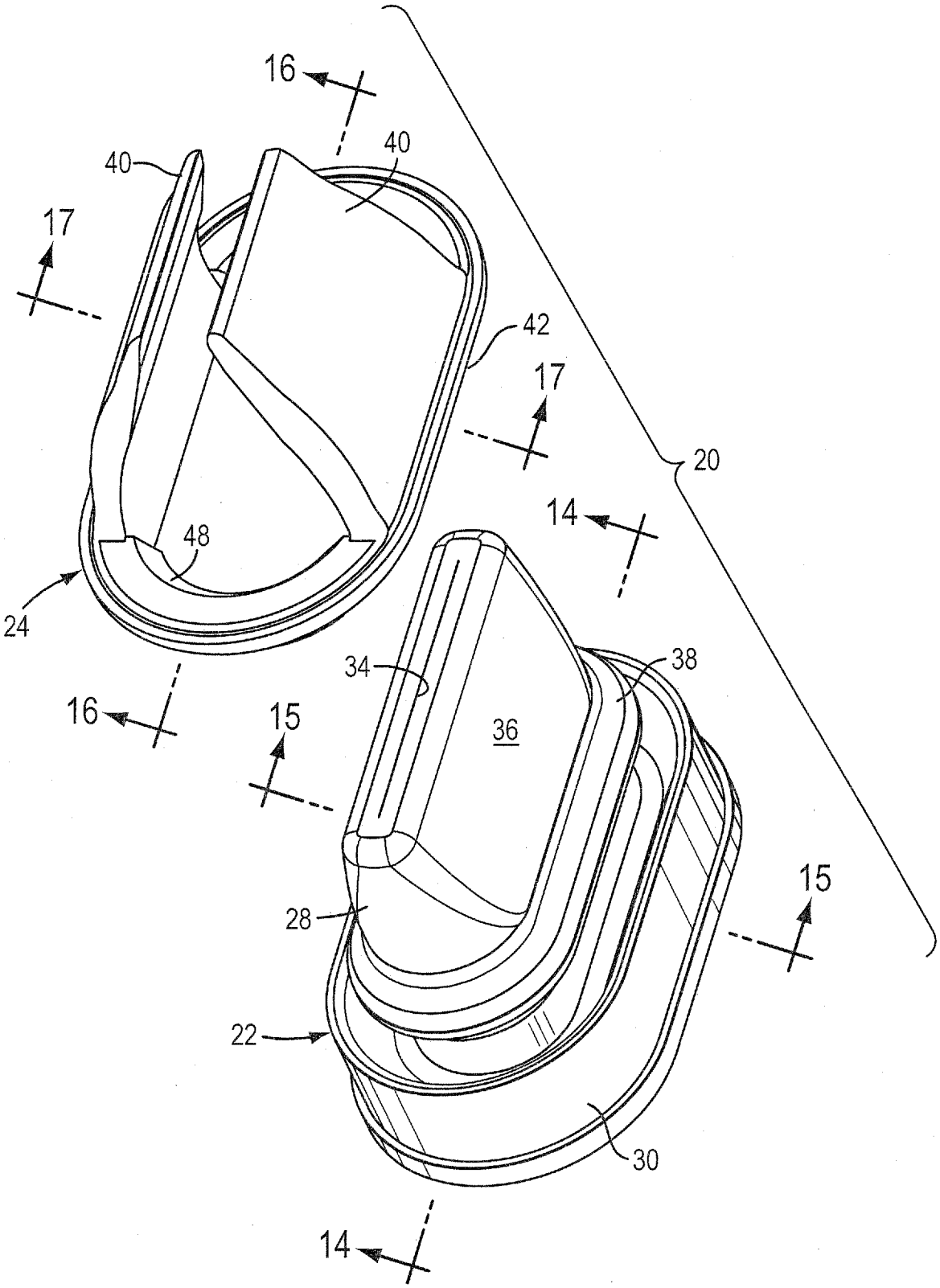


FIG. 12

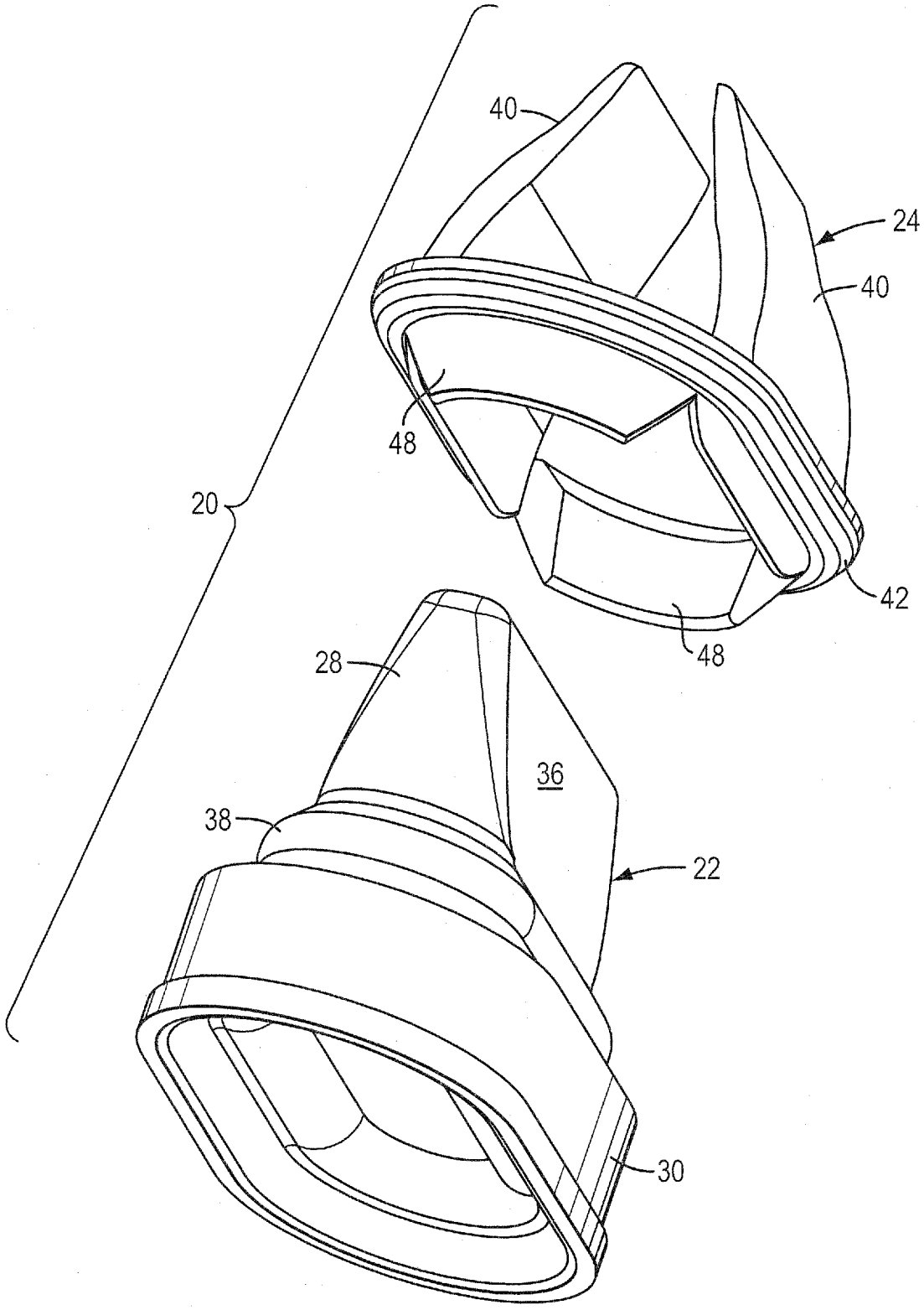


FIG. 13

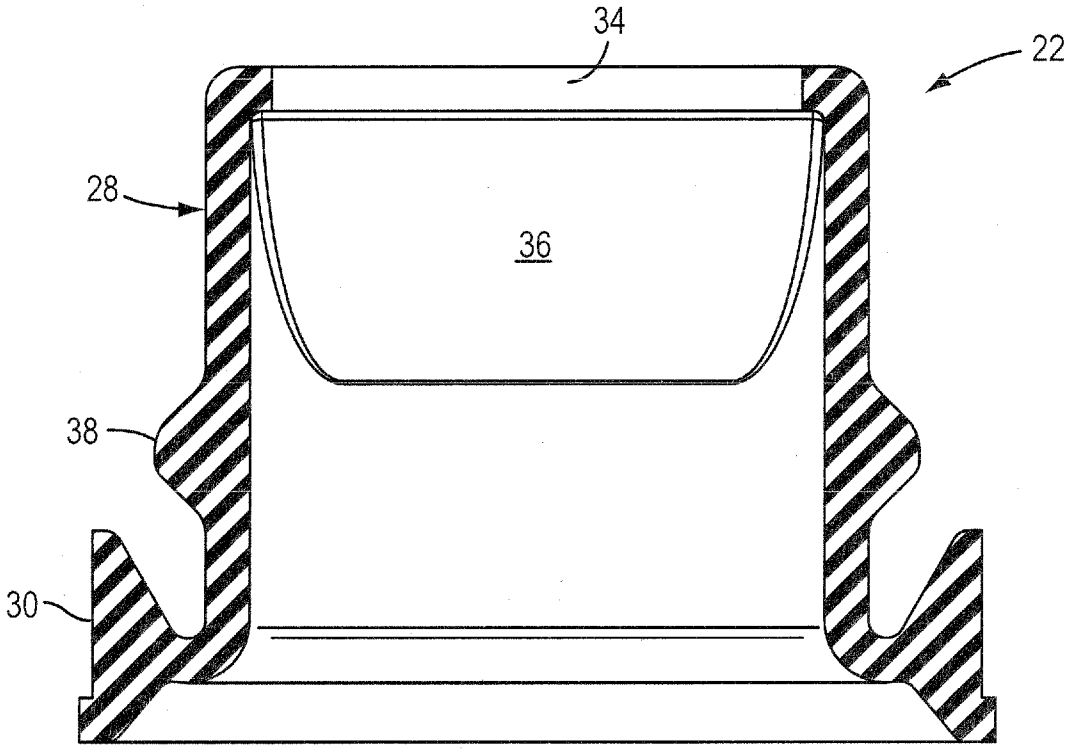


FIG. 14

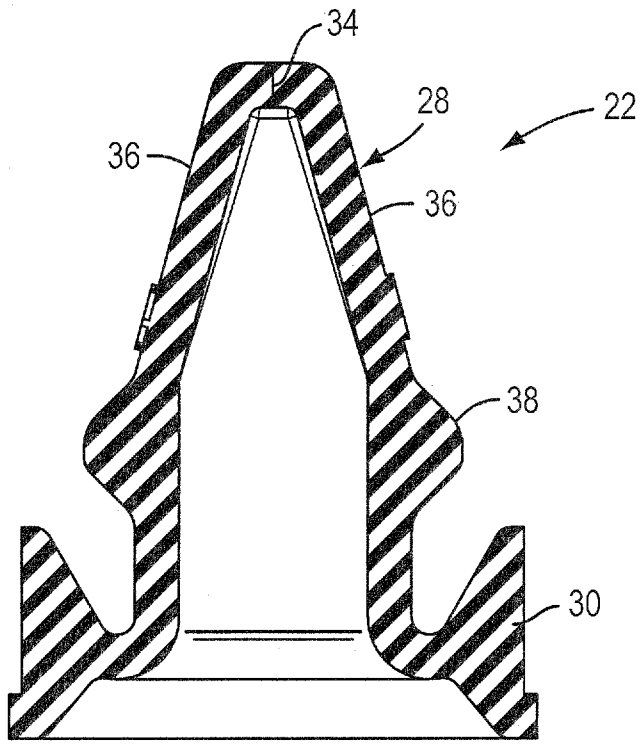


FIG. 15

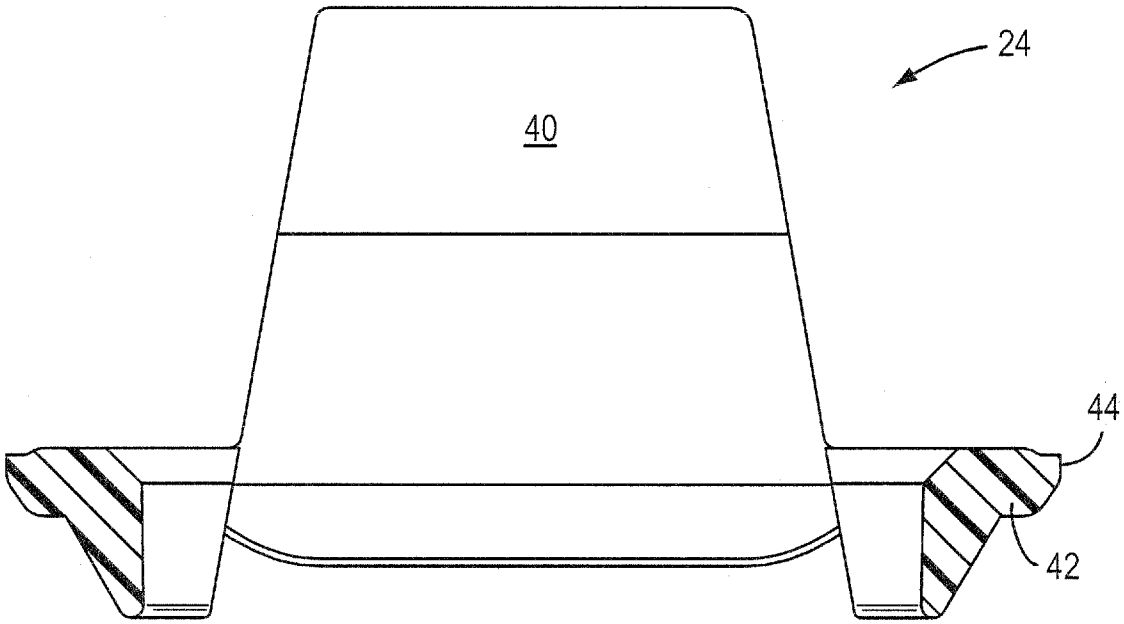


FIG. 16

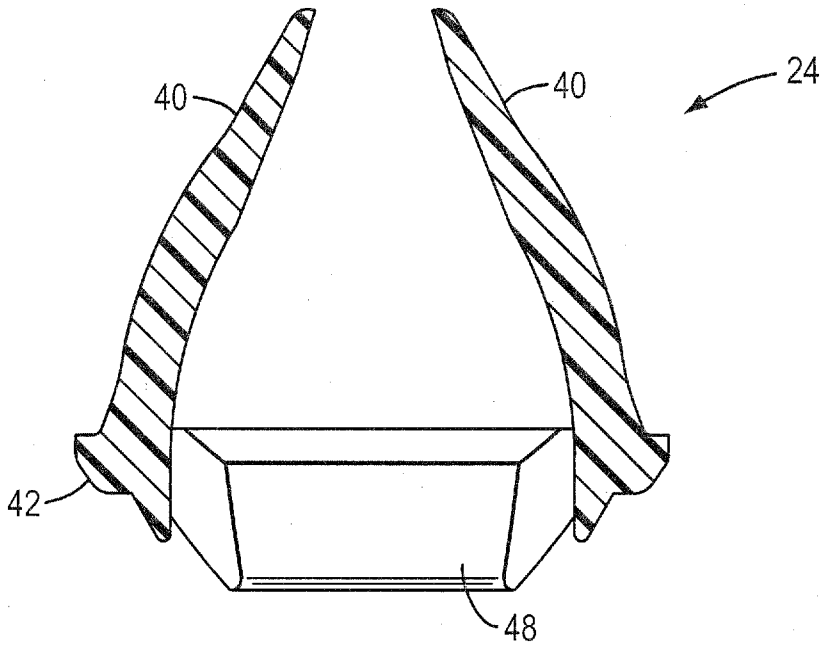
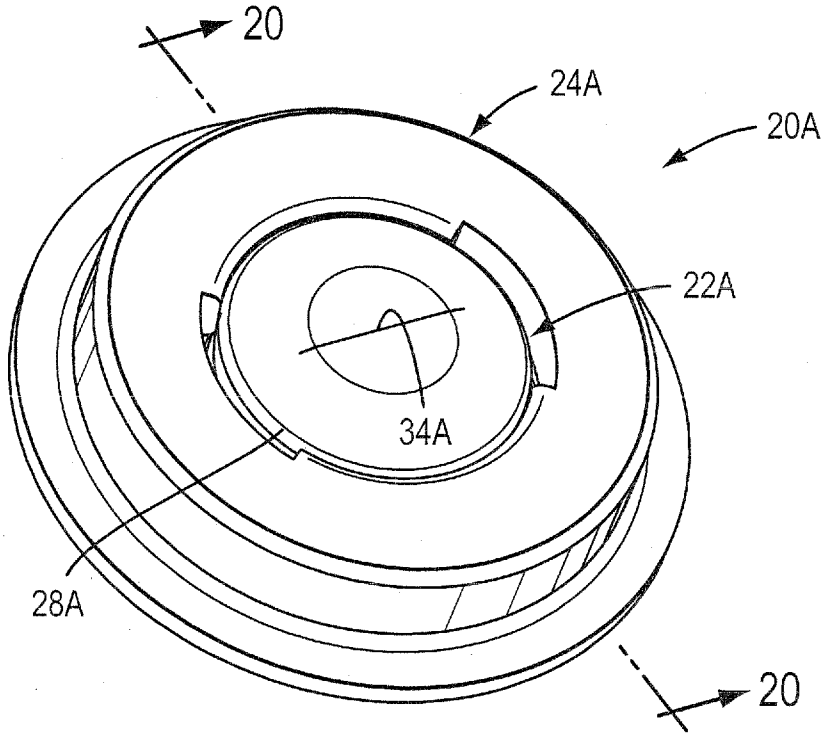


FIG. 17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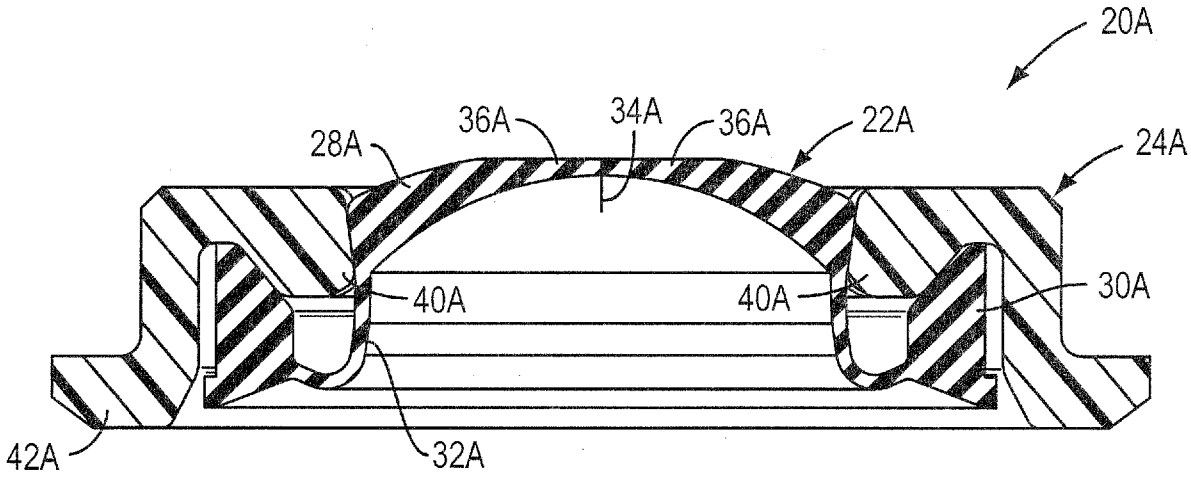
20A
22A
34A
28A
20

FIG. 18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36A
34A
36A
22A
24A
40A
40A
30A
42A
32A

FIG. 20

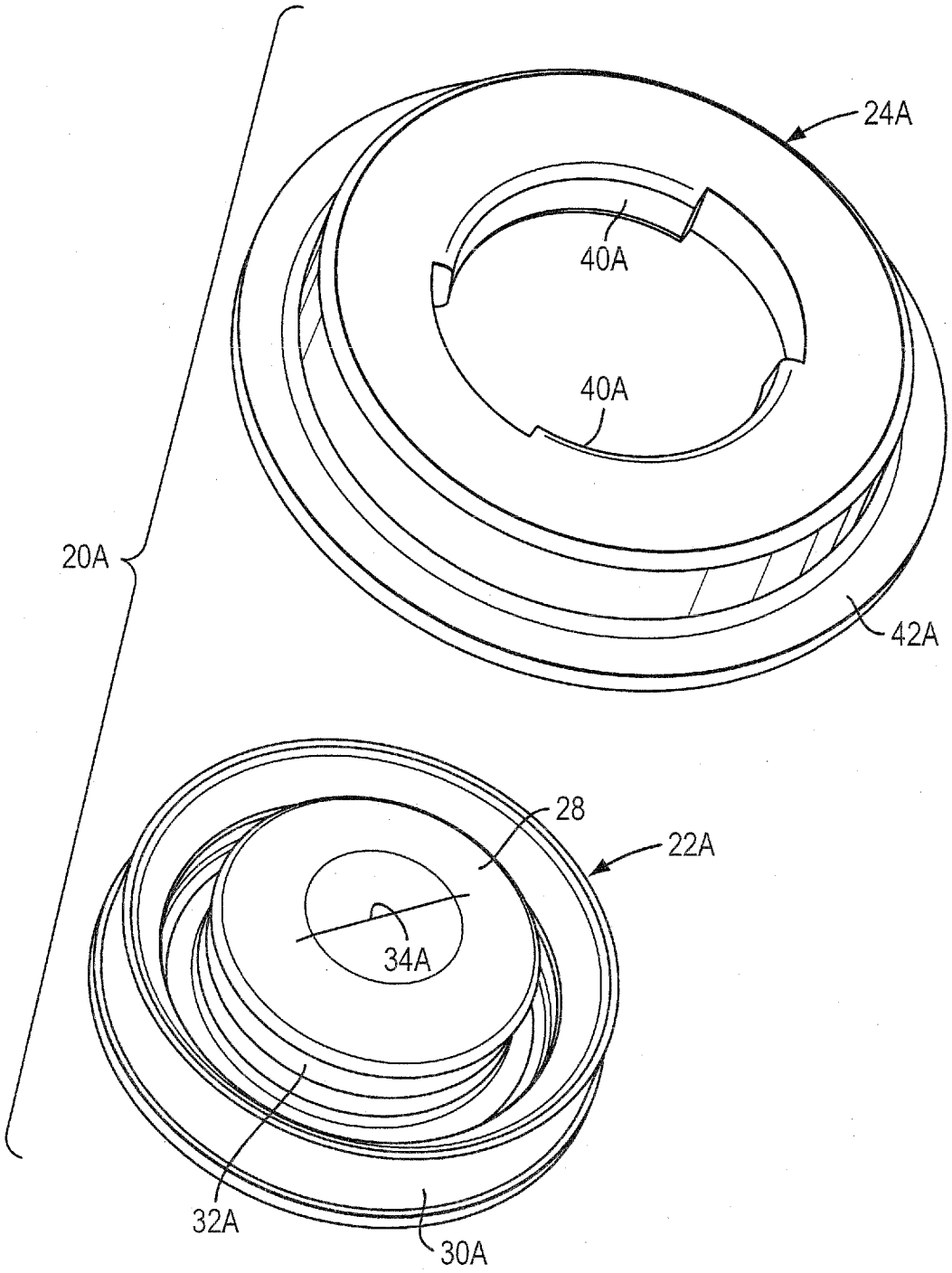


FIG. 19

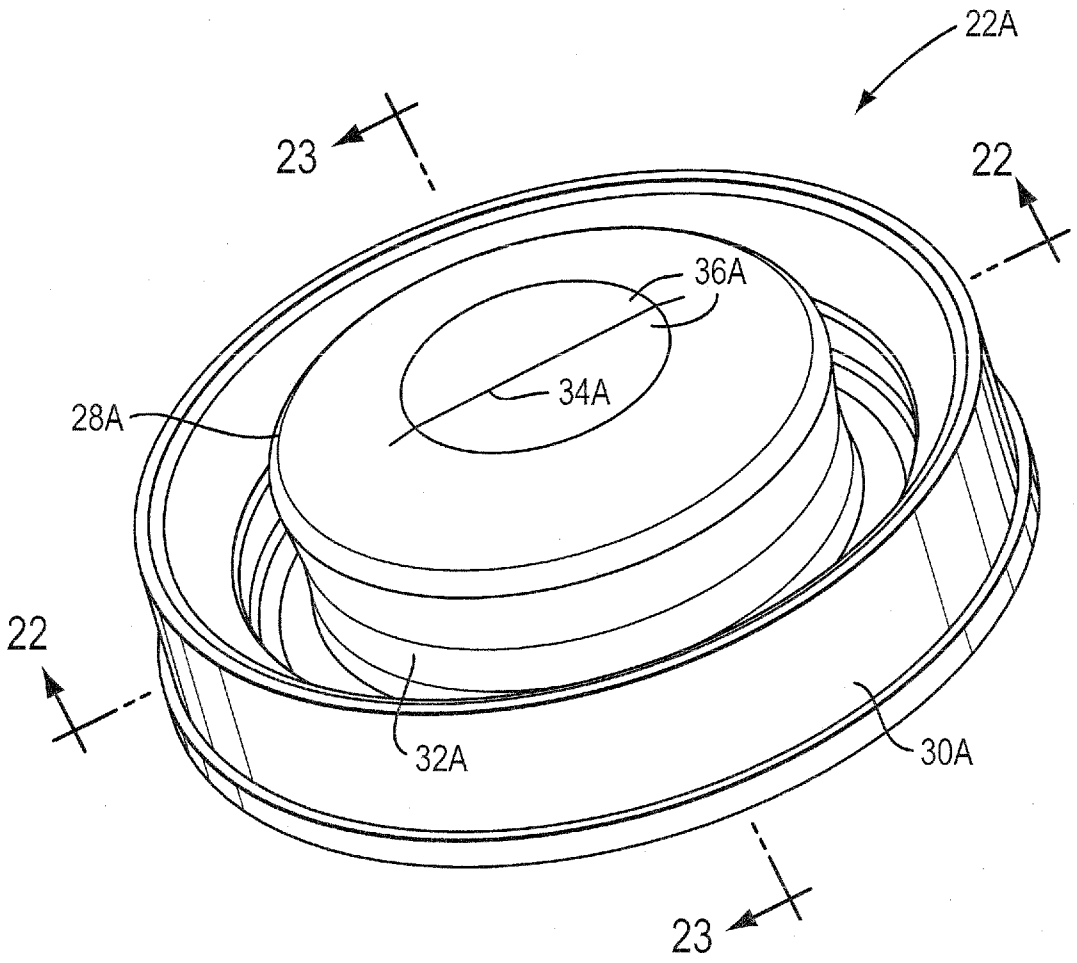


FIG. 21

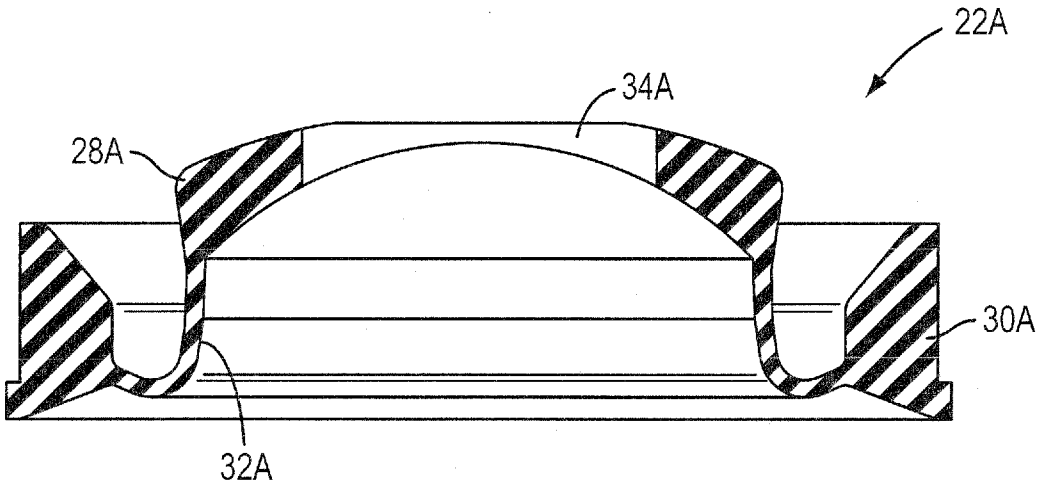


FIG. 22

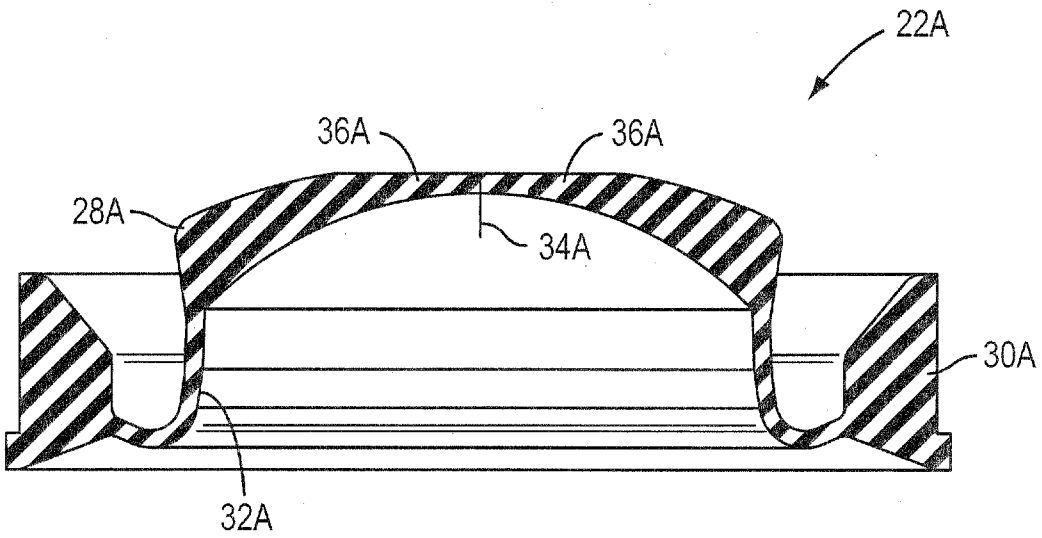
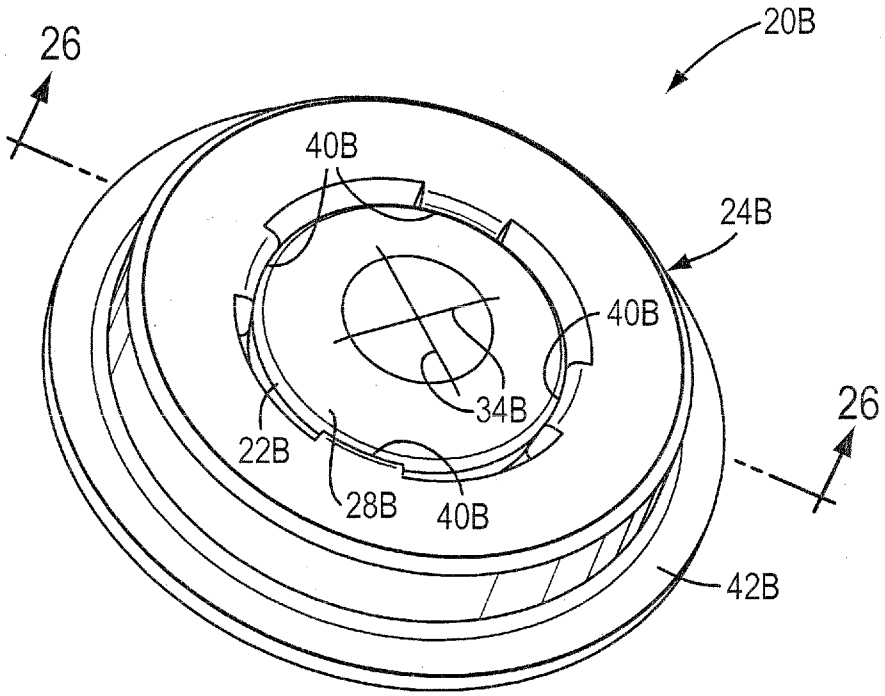


FIG. 23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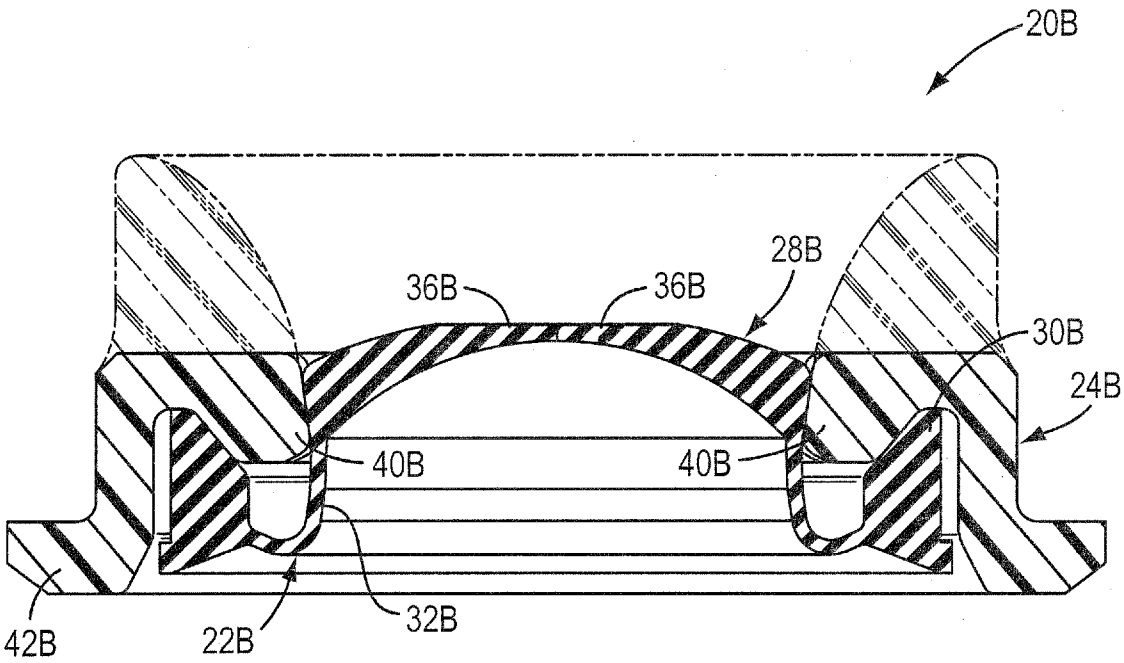
24B
40B
34B
26
22B
28B
40B
42B

FIG. 24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36B
30B
24B
40B
40B
32B
42B
22B

FIG. 26

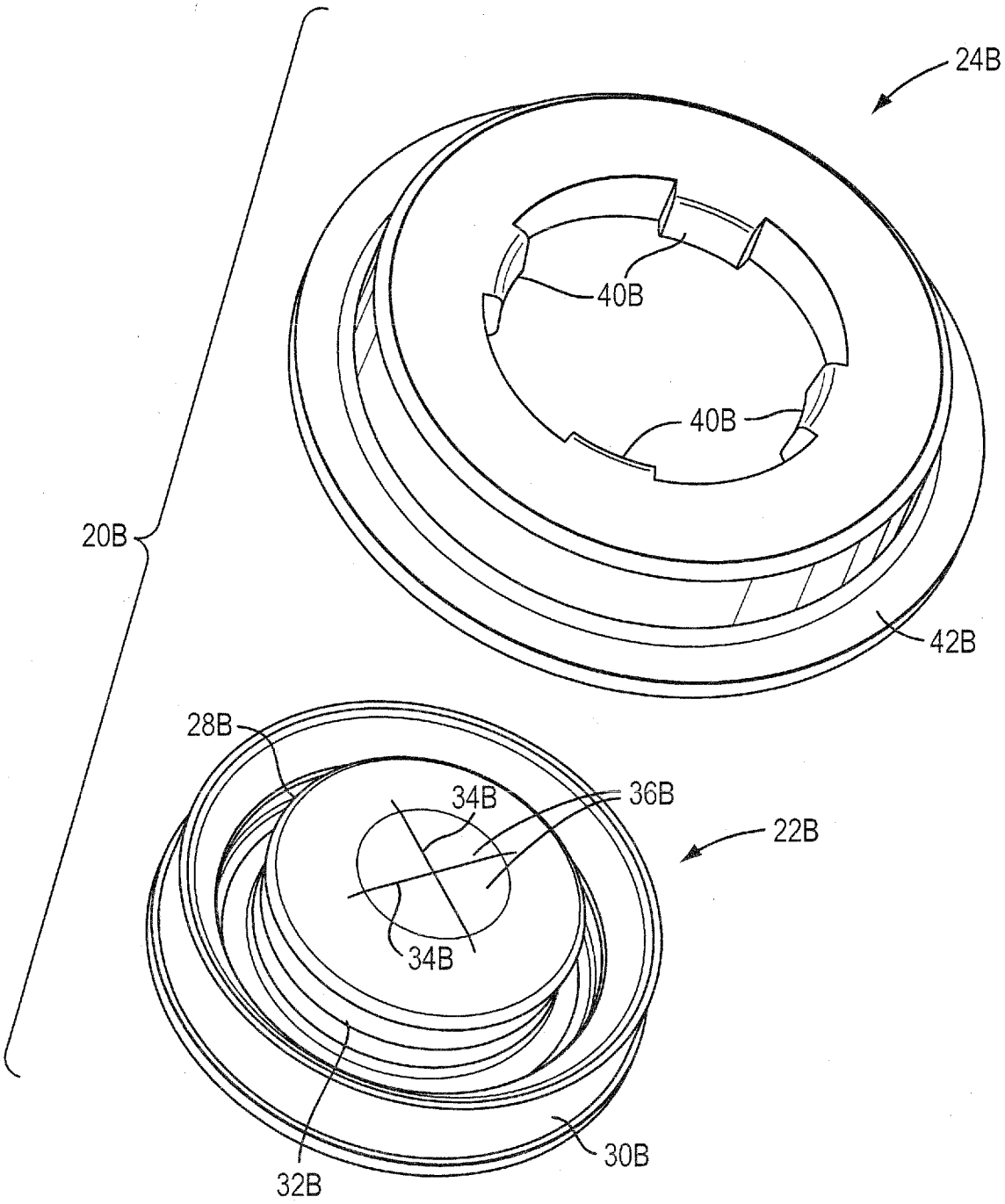


FIG. 25

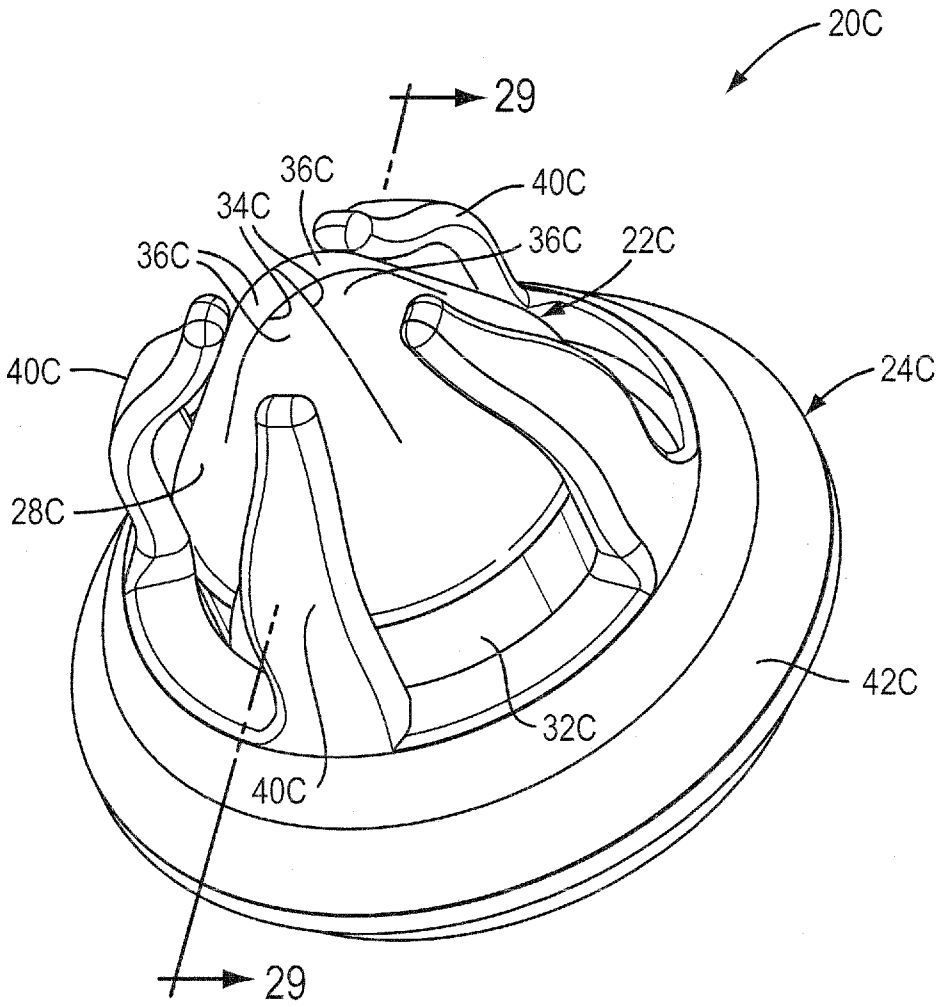


FIG. 27

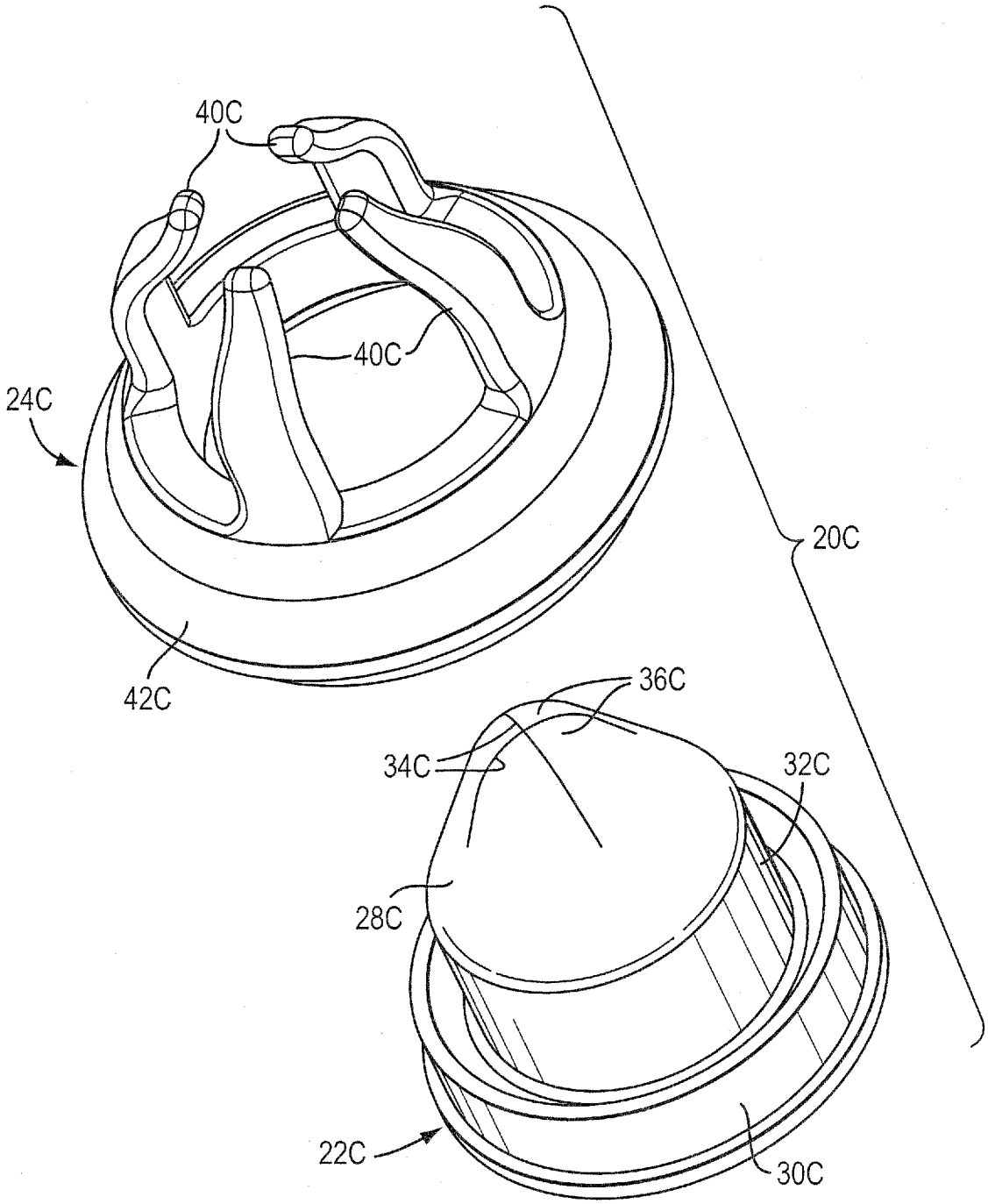


FIG. 28

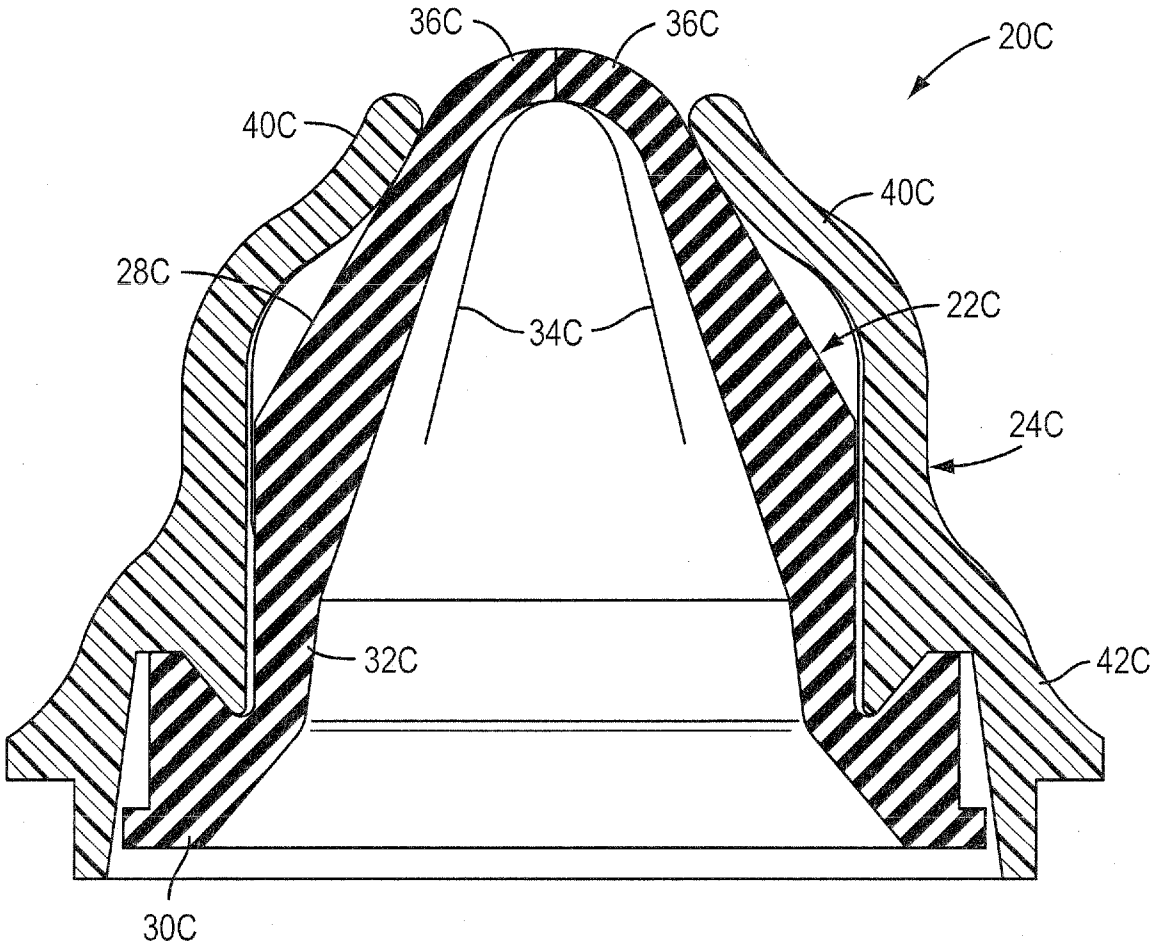
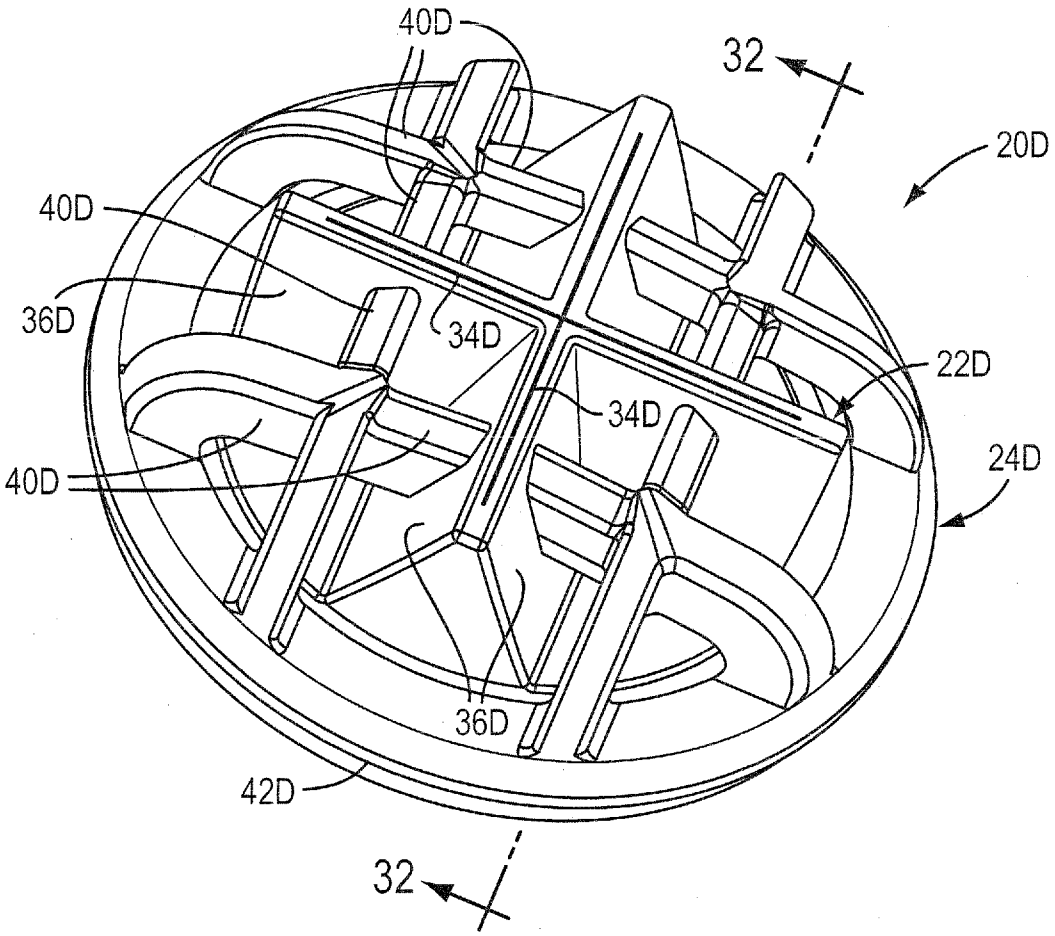


FIG. 29


40D
32
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34D
22D
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24D
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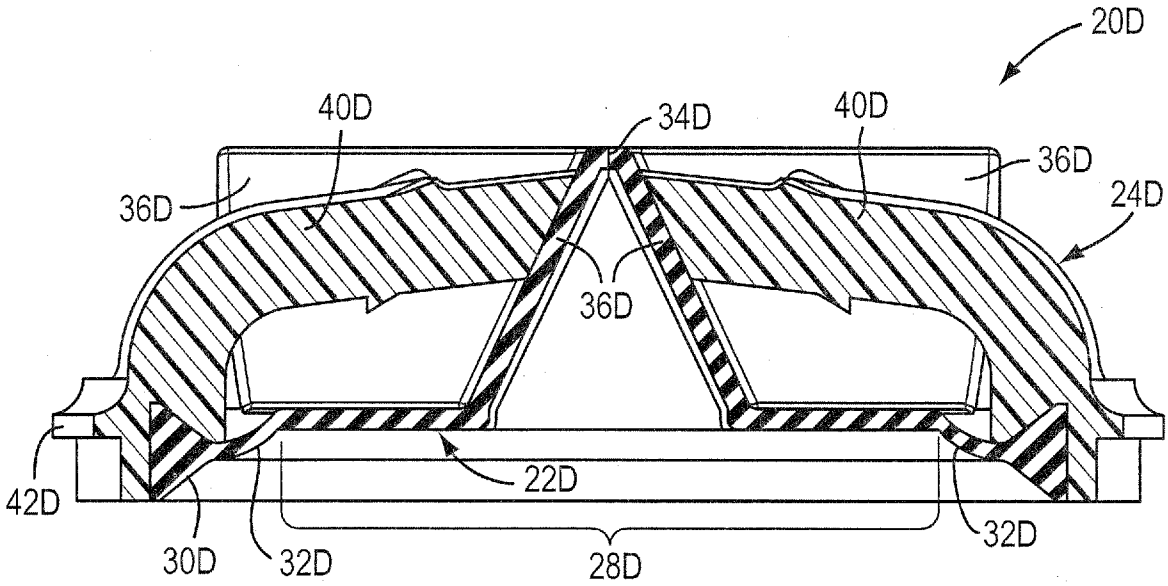
36D
42D
32

FIG. 30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28D
32D

FIG. 32

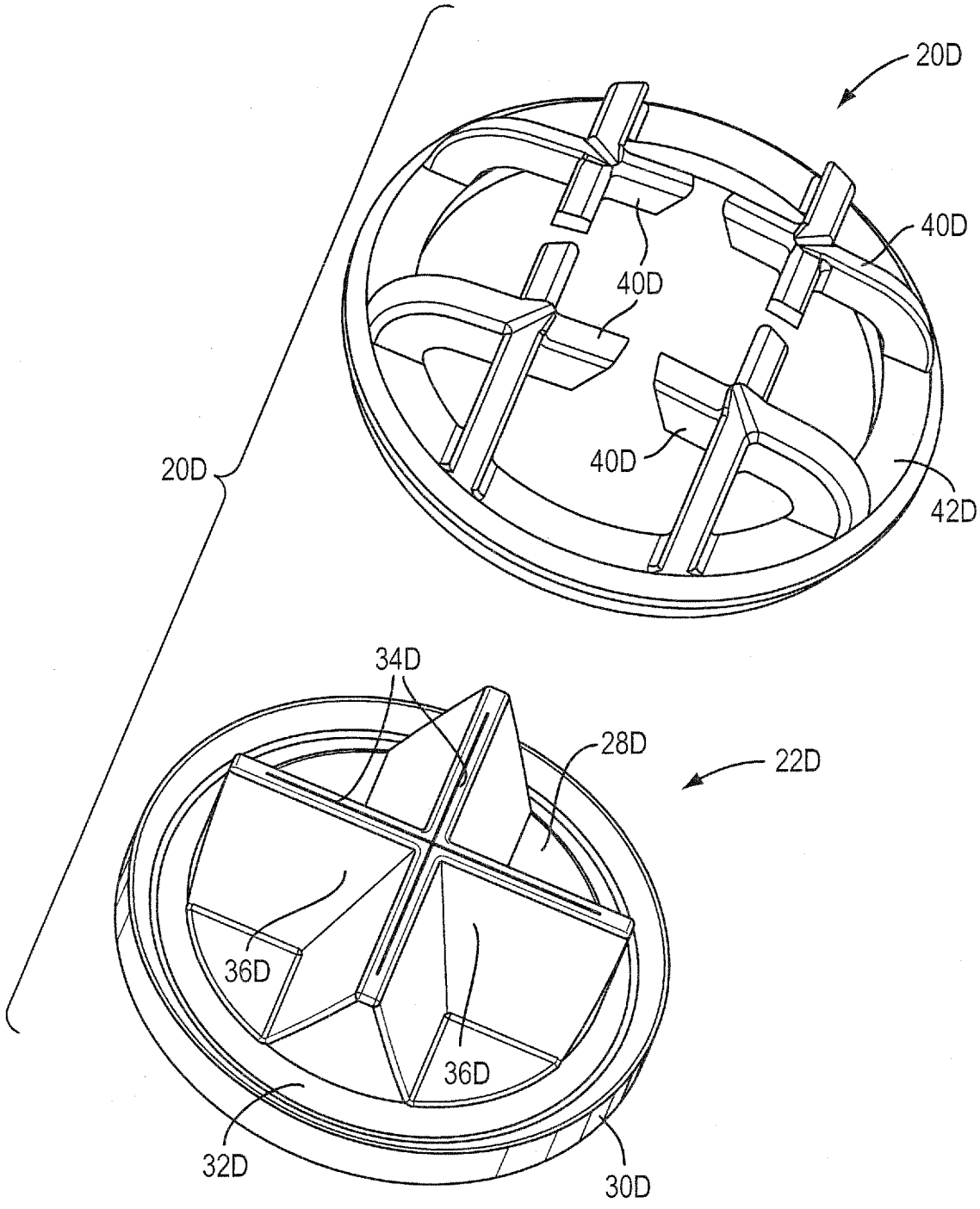

FIG. 31

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/030943

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B65B 11/00 (2011.01)
USPC - 222/484
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - B05B 11/00, 11/04; B65D 35/00, 35/24, 35/38, 35/52, 39/00, 47/00, 47/04, 47/20, 47/24 (2011.01)
USPC - 222/484, 490, 494

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---- Y	US 2004/0040987 A1 (RAMSEY et al) 4 March 2004 (04.03.2004) entire document	1-5, 10, 11 ---------- 6-9, 12-20
Y	US 2007/0295764 A1 (SOCIER) 27 December 2007 (27.12.2007) entire document	6-9, 12, 13
Y	US 5,398,853 (LATHAM) 21 March 1995 (21.05.1995) entire document	14-20

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 May 2011	26 MAY 2011

Name and mailing address of the ISA/US	Authorized officer:
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774