(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 184 236 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
12.05.2010 Bulletin 2010/19

(51) Int Cl.:
B65D 77/06 *(2006.01)*

(21) Application number: **09252292.9**

(22) Date of filing: **29.09.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA RS

(30) Priority: **07.11.2008 US 266635**

(71) Applicant: **Rieke Corporation**
Auburn, Indiana 46706 (US)

(72) Inventor: **Stalions, Stephen E**
Fort Wayne, Indiana 46845 (US)

(74) Representative: **Williams, Michael Ian et al**
Cleveland
40-43 Chancery Lane
London WC2A 1JQ (GB)

(54) **Bag-in-box assembly**

(57) A bag-in-box assembly (20) for receipt of a flowable product has a fitment (23) that defines a dispensing outlet (29) and an interfit portion (36) having a hex-shaped periphery. Also included is a plastic bag (22) which is constructed and arranged to receive the flowable product. The bag includes an opening (56) that is defined by a surrounding lip portion (57). The surrounding lip portion is conduction welded to a flange surface (51) of the fitment. The box includes a plurality of panels (27, 76, 77, 78, 79) and a plurality of fold-over flaps (30, 80, 81, 82, 83, 84). One fold-over flap (83) includes an opening (88) and the opening is defined in part by a shaped edge having four (88a, 88b, 88c, 88d) of the hex flats. This shaped edge is constructed and arranged to receive the interfit portion (36) of the fitment and secure the fitment in a fashion such that rotation of the fitment relative to the box is restricted.

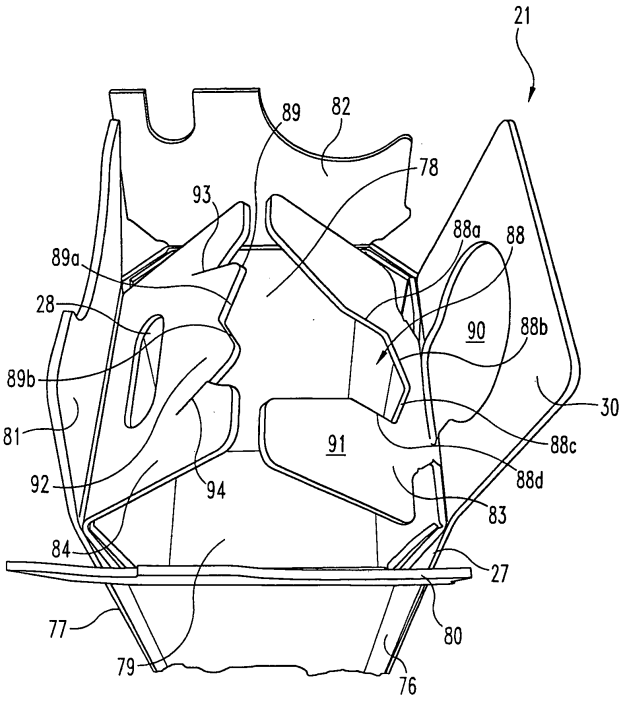

Fig. 18

EP 2 184 236 A2

Description

BACKGROUND OF THE INVENTION

[0001] Bag-in-box (BIB) constructions for pourable liquids and flowable products are now being used as a replacement for more rigid packaging for a variety of products, including those typically provided in bulk packaging. For example, bag-in-box constructions are now being used for food and beverage products, chemicals, cosmetics, inks, paints, and coatings. Some of the existing product advertising for bag-in-box constructions list, as one of the benefits of this construction concept, being suitable for use with manual, semi-automatic, and fully automatic fill lines. Other listed benefits include using less plastic than similar capacity rigid containers, such as plastic pails and cube-shaped containers. The cube-shaped box or container for BIB constructions minimizes dead space during transport and storage, allowing more product per pallet. Prior to filling, the box is collapsed into flat form and the bag is collapsed as well, thereby minimizing shipping and warehouse space requirements, even when a spout or fitment is already assembled with the bag. Many of the prior art bag constructions are constructed and arranged for filling of the bag prior to box assembly. Accordingly, the bags are constructed with sufficient material thickness and rigidity at the edges and seams so as to be able to be handled and transported as part of the automated boxing steps.

[0002] When the bag is constructed and arranged to be filled before being placed in the box, there are additional requirements on the bag construction. The overall shape of the bag when filled and the material selected must be factored into the fabrication and assembly requirements for the bag. The spout construction is also a consideration. Not only must the spout have a clearance opening in the box, but the box flaps have to be configured and folded in a particular way to be able to receive the spout during the automated assembly of the filled bag into the box. Different considerations are at issue when the bag is assembled into the box first and then filled with the selected product. Under these circumstances, greater attention must be paid to the construction of the fitment (or spout) and its relationship to the box.

[0003] The wide range and variety of prior art constructions for bag-in-box (BIB) products suggests that there are a variety of ways to arrange and fold the box as well as a variety of suitable bag configurations. While the box is typically of a corrugated cardboard construction, the bag material or materials are selected based in part on the product to be contained and based in part on the level of barrier desired. Further considerations with regard to the bag material or materials depend on the container size and the type or manner of handling. Bag material is a further variable that can be selected from a range of options, depending on the desired result. Suitable bag materials include polyethylene and oriented-nylon for standard barrier requirements. For high barrier requirements, a co-extruded nylon/EVOH is a bag material option.

[0004] The third primary component as part of many bag-in-box constructions is a spout or fitment that provides the access port for both filling the bag and dispensing product from the bag. The fourth primary component for these construction is a closing cap or lid of some type that is compatible with the style of fitment for closing the dispensing outlet opening or open end of the fitting. If a separate fitment is not used as a part of the construction, the most likely construction uses a reinforced fill and discharge port. This type of bag is able to be sealed upon filling and incorporates a puncturable seal that is penetrated by insertion of a discharge spout when dispensing.

[0005] When a separate fitment and closing cap are used, the fitment often includes a surface, such as a flange, for attachment of the bag by either adhesive or welding. Frequently, based on prior art examples, the bag with the fitment welded into position is filled and then boxed. Since a dispensing portion or outlet of the fitment extends outwardly from the surface of the bag, an opening in the box flap or flaps needs to be provided for a portion of the fitment to be received therein. The typical prior art examples include a couple of common forms for receiving the protruding end of the fitment. One form is a circular opening in a box panel or flap for the protruding fitment end to extend through. Installation requires movement of the fitment in a generally perpendicular direction relative to the planar surface of the box panel or flap. Another form is a slot opening with a part circular end. In order to install the fitment or spout, it needs to be moved into the slot in a generally parallel direction relative to the planar surface of the box panel or flap.

[0006] When the nature of the packaging and the product make it acceptable to fill the bag before being boxed, the focus is on the movement of the bag into the box. Less attention is likely directed to the spout or fitment since it merely needs to extend through a clearance opening in the box.

[0007] When it is desired to fill the bag and fitment subassembly after assembly into the box, the fitment (or spout) and its assembly with or into the box take on added importance. One aspect of importance is that after filling the bag, the fitment opening must be closed in some fashion. Automated capping equipment for the closing cap onto the fitment generates a turning torque on the fitment and at least some component of that torque is transferred to the interface between the fitment and the box. An axial force is also introduced as the closing cap is pushed in a downward axial direction as part of the capping procedure.

[0008] The embodiments disclosed herein are directed to addressing these considerations for the fitment, cap, and box construction. The relationships between these components and how they function and cooperate during the boxing, filling, and capping phases are disclosed as well as their novel and unobvious constructions.

BRIEF SUMMARY

[0009] A bag-in-box assembly for receipt of a flowable product has a fitment that defines a dispensing outlet and an interfit portion having a polygon periphery. Also included is a bag which is constructed and arranged to receive the flowable product. The bag includes an opening that is defined by a surrounding lip portion. The surrounding lip portion is attached to a portion of the fitment. The box includes a plurality of panels and a plurality of fold-over flaps. One fold-over flap includes an opening and the opening is defined in part by an edge having a polygon shape. This polygon shaped edge is constructed and arranged to receive the interfit portion of the fitment and secure the fitment in a fashion such that rotation of the fitment relative to the box is restricted.

[0010] One object of the present disclosure is to describe an improved bag-in-box assembly.

[0011] According to an aspect of the invention there is provided a fitment for a bag-in-box assembly comprising: a body defining a hollow interior and including an end defining a dispensing opening; an upper flange; a lower flange; and an interfit portion having a polygon periphery and being axially located between said upper flange and said lower flange.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS

OF THE DRAWINGS

[0012]

FIG. 1 is a top perspective view of a bag-in-box assembly according to the disclosed embodiments.

FIG. 2 is a top perspective view of the FIG. 1 bag-in-box assembly with the threaded closing cap removed.

FIG. 3 is a front elevational view of a fitment comprising a component part of the FIG. 1 bag-in-box assembly

FIG. 4 is a side elevational view of the FIG. 3 fitment.

FIG. 5 is a top plan view of the FIG. 3 fitment.

FIG. 6 is a bottom plan view of the FIG. 3 fitment.

FIG. 7 is a front elevational view, in full section, of the FIG. 3 fitment as viewed along line 7-7 in FIG. 5.

FIG. 8 is a perspective view of the FIG. 3 fitment.

FIG. 9 is a partial, front elevational view of a fitment (FIG. 3) and bag subassembly, the bag comprising a component part of the FIG. 1 bag-in-box assembly.

FIG. 10 is a partial, side elevational view of the FIG. 9 subassembly.

FIG. 11 is a partial, top plan view of the FIG. 9 subassembly.

FIG. 12 is a partial, perspective view of the FIG. 9 subassembly.

FIG. 13 is a front elevational view of the FIG. 9 subassembly with a threaded closing cap applied.

FIG. 14 is a side elevational view of the FIG. 13 bag, fitment, and closing cap assembly.

FIG. 15 is a top plan view of the FIG. 13 assembly.

FIG. 16 is a front elevational view, in full section, of the FIG. 13 assembly, as viewed along line 16-16 in FIG. 15.

FIG. 17 is a perspective view of the FIG. 13 assembly.

FIG. 18 is a perspective view of an open box comprising a component part of the FIG. 1 bag-in-box assembly.

FIG. 19 is a perspective view of the FIG. 18 box with the FIG. 9 fitment and bag subassembly installed.

FIG. 20 is a perspective view of the FIG. 19 combination with the two interior flaps folded together.

FIG. 21 is a perspective view of the FIG. 19 combination with two outer flaps folded into a closing position.

FIG. 22 is a perspective view of the FIG. 19 combination with one of the last two outer flaps folded into a closing position.

DETAILED DESCRIPTION

[0013] For the purposes of promoting an understanding of the disclosure, reference will now be made to the embodiments illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the disclosure is thereby intended, such alterations and further modifications in the illustrated device and its use, and such further applications of the principles of the disclosure as illustrated therein being contemplated as would normally occur to one skilled in the art to which the disclosure relates.

[0014] Referring to FIGS. 1 and 2, there is illustrated a bag-in-bag box assembly 20 according to the present disclosure that includes a box 21, bag 22, fitment 23, and

threaded closing cap 24. Box 21 is a corrugated cardboard box with a plurality of panels and a plurality of fold-over flaps that are constructed and arranged to create the illustrated box construction. Panel 27 represents the front of the box in terms of marking and product presentation. Oblong opening 28 extends through the corresponding defining flaps of box 21 to the open interior of the box 21 that receives the bag 22. This oblong opening 28 provides a hand hold to assist in lifting and moving the assembly 20. This hand hold opening 28 also assists in handling the box when pouring contents out of the bag via the outlet opening 29 of fitment 23. The box 21 construction and the sequential steps of box assembly are illustrated in drawings FIGS. 18-22. The final step to get from FIG. 22 to FIG. 2 in terms of the box construction is to fold over top flap 30 and glue it into position. In going from FIG. 2 to FIG. 1, closing cap 24 is added.

[0015] Referring now to FIGS. 3-8, the details of fitment 23 are illustrated. Fitment 23 is a unitary, molded plastic component with a body defining a hollow interior and a dispensing opening 29 defined by the externally-threaded end 33 of fitment 23. Fitment 23 is constructed and arranged with an upper flange 34, a lower or base flange 35, and a recessed hex (wall) portion 36. These two flanges 34 and 35 are each axially adjacent portion 36. Portion 36 constitutes the interfit portion for assembly into the box, as will be described in greater detail herein, and in addition to the illustrated hex shape, interfit portion 36 can have a variety of polygon periphery shapes. Fitment 23 is a generally uniform and symmetrical annular form about axial centerline 37. Cutting plane 7-7 in FIG. 5 provides the section view of FIG. 7.

[0016] With continued reference to FIGS. 3-8, externally-threaded end 33 extends for approximately two-thirds of the overall axial height at which location (the lower edge of end 33), flange 34 is positioned. In terms of axial directions and structural locations as used herein, "lower" means closer to the bag. "Upper" means farther away from the bag. "Inwardly" means closer to and in the direction of the bag. "Outwardly" means farther away from and in a direction away from the bag. Moving axially inwardly, the next section or portion is hex interfit portion 36, followed by the lower flange 35. Flange 34 has a generally hex shape with the hex "points" 40 being smoothly rounded. These hex "points" 40 are generally aligned (i.e., centered on the same radial line) with the hex points 41 of the hex interfit portion 36. The flats 42 of flange 34 are generally aligned with the flats 43 of the hex interfit portion 36. The lower flange 35 has a generally cylindrical shape and an outside diameter dimension such that its outer edge 44 extends beyond the outermost portions of upper flange 34. The hex interfit portion 36 is radially inset or recessed relative to both flanges 34 and 35. The inside diameter of end 33 has a smooth, straight, cylindrical form.

[0017] On the underside surface 47 of upper flange 34, there are integrally molded six depending ribs 48, extending away from flange 34 in the direction of flange 35. These ribs 48 are constructed and arranged to press into the corrugated cardboard box flap to assist in preventing or at least limiting bag 22 and fitment 23 shifting during filling and handling. Each protruding rib 48 extends longitudinally in the generally same direction so as to be substantially parallel to each other. This arrangement enables the ribs 48 to be straight pulls from the two clamshell halves of the mold cavity.

[0018] Referring now to FIGS. 9-12, fitment 23 is illustrated as assembled with bag 22. The bag 22 is a plastic bag with the bag material or materials selected in part based on the contents to be filled and in part on the strength required and in part on the size or capacity. In the preferred and exemplary embodiment, the bag-in-box assembly 20 is used for paint and the bag 22 is a three-layer lamination of different polymers. While these bag-in-box constructions would typically be used for capacities in the five liter to twenty liter range, the preferred embodiment, as used for paint, is a twenty liter capacity.

[0019] With regard to the three-layer lamination of different polymers, the inner or interior layer 50 is selected to be compatible with the product and the chemistry of the product that is filled into the bag. The material selection also needs to be compatible for welding of the material to the upper surface 51 of the lower flange 35 of fitment 23. The middle or intermediate layer 52 provides barrier properties to the lamination to prevent ingress and egress of oxygen, moisture vapor, etc. The outer layer 53 is fabricated out of a tougher polymer for providing resistance to puncture and abrasion. While variations to this laminated structure are contemplated, the only layer that might be considered as "optional" is the intermediate layer if a barrier is not required, considering the contents to be filled in the bag.

[0020] Bag 22 includes an upper or top generally circular opening 56 whose diameter is just slightly larger than the dimension across the hex "points" 40 of the upper flange 34. This particular sizing leaves an annular lip 57 with a radial width or spacing of between 1 mm and 4 mm from the opening edge 58 to the outer circular edge 59 of lower flange 35. This annular lip 57 can be thought of as actually defining circular opening 56.

[0021] Lip 57 is conduction welded onto the upper surface 51 of lower flange 35 so as to create a continuous circular seal completely around the hex portion 36 of fitment 23 on the upper surface 51. The nature of the conduction weld also securely attaches the bag 22 to fitment 23 with the requisite structural integrity and strength for the intended function.

[0022] Referring now to FIGS. 13-17, the assembled combination of the bag 22, fitment 23, and threaded closing cap 24 is illustrated. It is assumed for these drawings that the bag 22 is conduction welded to the upper surface 51 of the lower flange 35 as already described for drawing FIGS. 7-12. The bag 22 and fitment 23 subassembly, as illustrated in FIGS. 7-12, remains the same for FIGS. 13-17. The only change is the addition of internally-threaded closing cap 24 which is fully threaded onto the

externally-threaded end 33 of fitment 23. As would be understood, it is common for the closing cap 24 to be applied to fitment 23 only after the bag has been filled with the desired product. This in turn would mean that at the time of filling, and prior to attaching closing cap 24, the fitment 23 and bag 22 are assembled into the box. However, for these drawing figures, the box 21 has been eliminated as a way to more clearly illustrate the relationship between the bag 22, the fitment 23, and the closing cap 24. In this regard, the section view of FIG. 16 is based on the 16-16 cutting plane of FIG. 15.

[0023] Closing cap 24 is a unitary, molded plastic component that includes a generally cylindrical body 62, substantially flat circular to panel 63, and a pair of opposite-disposed protrusions 64 and 65. The generally cylindrical body 62 is internally-threaded and is formed with a closely spaced series of axial ribs 66 on the outer surface. The inner surface 63a of top panel 63 is formed with a depending revolved protrusion 67 that plugs the inside diameter surface 68 of end 33. The annular, depending construction and arrangement of protrusion 67 is spaced radially inwardly from the wall defining cylindrical body 62 so as to create an inverted annular channel 69 for receipt of the upper edge 70 of end 33. The upper edge 70 seats into the base of channel 69 before the lower edge 71 bottoms out against the upper surface 72 of flange 34.

[0024] The pair of protrusions 64 and 65 provide additional leverage for generating removal torque. These protrusions 64 and 65 can also be utilized as part of the fixturing for automated handling and capping equipment. The radial extent of each protrusion does not extend beyond the outer edge of the flats 42 on upper flange 34.

[0025] Referring now to FIGS. 18-22, the box assembly steps for receiving the bag 22 and fitment 23 and for completing the construction of the box are illustrated. Box 21 begins with a construction that provides four sidewalls or panels 27, 76, 77, and 78 surrounding a bottom panel 79. It should be understood that prior to the FIG. 18 illustration, box 21 would be in a flat form and folded into the illustrated construction with the bottom panel 79 typically being formed from adjoined flaps that are glued together.

[0026] Included as a part of the box 21 construction are four top flaps 30, 80, 81, and 82. These four top flaps are outer or exterior flaps and complement the two interior or inner flaps 83 and 84. The specific construction in terms of how the panels and flaps are shaped, cut, and folded is to some degree optional, so long as a structurally sound box is able to be constructed and includes the four top flaps 30, 80, 81, and 82 and the two inner flaps 83 and 84. It is also to be understood that the overall construction of box 21 is selected such that it has an interior volume suitable for holding bag 22 as filled with the desired product and the desired volume or quantity of product.

[0027] Given the fact that the four side panels 27, 76, 77, and 78 and the bottom panel 79 can be configured and secured together in a variety of ways, the focus in terms of the assembly sequence is on the top flaps 30, 80, 81, and 82 and the two inner flaps 83 and 84. Flap 83 includes a notched out opening 88 that has a part-hex edge shape including four (88a, 88b, 88c, and 88d) of the six flats for a full hex contour. Flap 84 defines oblong opening 28 and the inner edge 89 of flap 84 is constructed and arranged with the other two flats 89a and 89b for the full hex contour. The size, shape, and location of flaps 83 and 84 is such that when these two are folded flat, they cooperate to define a full hex contour for the resulting opening. Flap 30 includes a clearance opening 90 that overlaps and generally concentrically surrounds the hex opening formed by the folded together combination of flaps 83 and 84. The four top flaps and the two inner flaps are all considered to be fold-over flaps in terms of their use, construction, and the manner in which they are manipulated to complete the box construction as disclosed herein.

[0028] Starting with the FIG. 18 box construction status, the bag 22 and fitment 23 subassembly, as a welded combination as illustrated in FIGS. 9-12 and without the closing cap 24 threaded on, is installed, see FIG. 19. In order to achieve the FIG. 19 assembly, the partial hex form of opening 88 receives the hex shape of interfit portion 36. As described, interfit portion 36 is identified in this manner since this is the portion that fits into the opening in flap 83. While the hex shape of interfit portion 36 matches the part-hex shape of the opening in flap 83 when flap 84 is closed into position, those two flaps 83 and 84 cooperate to define a hex opening that closely matches the hex periphery of interfit portion 36. The close cooperating fit of the box hex opening around interfit portion 36 secures the fitment so that it does not rotate or spin relative to the box when the closing cap is applied. The upper flange 34 is positioned on top of flap 83 and is in direct contact with the upper surface 91 of flap 83 such that the depending ribs 48 are able to press into the corrugated cardboard surface 91 of flap 83 to assist in preventing, or at least limiting, any bag 22 and fitment 23 shifting during filling and handling. When flap 84 is closed into position, the portions of the ribs 48 contacting the upper surface of flap 84 press into that corrugated cardboard surface. The upper surface 51 of flange 35 is positioned in direct contact with the underside (interior) surface of flap 83 and of flap 84.

[0029] After the bag 22 and fitment 23 subassembly is fitted into the partial hex form of opening 88, as illustrated in FIG. 19, flap 84 is folded into position in order to complete the hex shape of the receiving opening and thereby completely capture the hex interfit portion 36 of fitment 23 (see FIG. 20). This assembly of the fitment (and bag) into the cardboard flaps 83 and 84 is achieved without the need for any glue or adhesive and without the need for any mechanical fasteners. The hex-to-hex interfit in combination with the upper and lower flanges 34 and 35 is sufficient to lock the fitment 23 into the matching hex opening defined by the combination of cardboard flaps 83 and 84. The mating form of flap 84 that completes the

hex shape for the opening is positioned as part of center portion 92. Slits 93 and 94 separate the sides of portion 92 from the remainder of flap 84. These slits 93 and 94 provide added flexibility to portion 92 in order to facilitate its movement into position against interfit portion 36.

[0030] Following the assembly stage represented by FIG. 20, flaps 80 and 82 are folded over to partially close the top of the box and these two flaps are glued in position, as is illustrated in FIG. 21. The next step is to fold over and glue flap 81, as illustrated in FIG. 22. The final stage in completing box 21 is to fold over and glue flap 30. This results in the final construction, as illustrated in FIG. 2. The next step is to fill the bag with the desired product in the desired volume or quantity and thereafter apply closing cap 24 in order to complete and create the FIG. 1 structure.

[0031] As described, fitment 23 slides into the partial hex form of flap 83 without the use of glue or adhesive. Further, no portion of bag 22 is adhesively attached to any portion of the box. After the bag and fitment are assembled and the box construction completed, the bag is filled, in this embodiment with paint, then capped using closing cap 24, and is ready to be shipped. The matching hex shapes of the portion 36 periphery and of the edge for the opening defined by flaps 83 and 84 prevents rotation of the fitment 23 relative to the box in either direction during capping, removal, and recapping. The upper and lower flanges 34 and 35 prevent axial movement of the fitment 23 relative to the box flaps, in either direction, as the bag 22 is filled and the assembly handled.

[0032] While portion 36 is described as preferably having a hex peripheral shape that matches the hex opening defined by flaps 83 and 84, other shapes are contemplated, so long as the anti-rotation feature and relationship between fitment 23 and the opening in flaps 83 and 84 is maintained. For example, an octagon shape can be provided as another polygon periphery for portion 36 and similar changes would then be made to the opening defined by the combination of flaps 83 and 84. If an octagon is selected for the polygon periphery of portion 36, then flap 83 would typically include five of the eight flats while flap 84 would complete the matching octagon shape by providing the other three flats. Since the selected shape can be any one of a variety of polygons, that becomes one way to describe the peripheral shape of portion 36 as well as describing the matching opening defined by flats 83 and 84. The portion 36 has a polygon periphery, with the number of flat sides selected to lock into a matching opening so as to create a non-rotational relationship for the fitment 23 relative to the receiving flaps of box 21. The upper and lower flanges 34 and 35 cooperate with this overall construction so as to prevent any noticeable axial movement of the fitment 23 relative to flaps 83 and 84.

[0033] While the preferred embodiment of the invention has been illustrated and described in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character, it being understood that all changes and modifications that come within the spirit of the invention are desired to be protected.

Claims

1. A bag-in-box assembly for receipt of a flowable product comprising:

a fitment defining a dispensing outlet for said flowable product and including an interfit portion having a polygon periphery;
a bag constructed and arranged to receive said flowable product, said bag including an opening defined by a lip portion, said lip portion being attached to said fitment; and
a box including a plurality of panels and a plurality of fold-over flaps, one fold-over flap of said plurality of fold-over flaps including an opening, said opening being defined in part by an edge having a polygon shape, said edge being constructed and arranged to receive said interfit portion.

2. The bag-in-box assembly of claim 1 wherein the fitment includes a radial flange that is axially adjacent said interfit portion.

3. The bag-in-box assembly of claim 2 wherein said radial flange includes a depending rib that is constructed and arranged for engaging a fold-over flap.

4. The bag-in-box assembly of any of the preceding claims wherein another fold-over flap of said plurality of fold-over flaps includes a contoured edge having a polygon shape.

5. The bag-in-box assembly of claim 4 wherein said one fold-over flap and said another fold-over flap are constructed and arranged to fold together to define a polygon-shaped opening corresponding to the polygon periphery of said interfit portion.

6. The bag-in-box assembly of any of the preceding claims wherein said polygon periphery of said interfit portion is a hexagon with six flats.

7. The bag-in-box assembly of claim 6 wherein said polygon-shaped opening as defined by the combination of said one fold-over flap and said another fold-over flap is a hexagon with six flats.

8. The bag-in-box assembly of claim 7 wherein said one fold-over flap provides four of said six flats for the hexagon-shaped opening.

9. The bag-in-box assembly of any of the preceding

claims wherein said bag is attached to a flange of said fitment by a conduction weld.

10. The bag-in-box assembly of claim 9 wherein said bag is a lamination of three layers.

11. The bag-in-box assembly of any of the preceding claims wherein the fitment comprises:

a body defining a hollow interior and including an end defining a dispensing opening;
an upper flange; and
a lower flange;
wherein the interfit portion is located axially between said upper flange and said lower flange.

12. The bag-in-box assembly of claim 11 wherein said polygon periphery is a hexagon.

13. The bag-in-box assembly of claim 12 wherein said upper flange includes a plurality of depending ribs.

14. A method of fabricating a bag-in-box assembly for the receipt of product, said method comprising the following steps:

providing a fitment with a polygon portion and an adjacent flange;
providing a bag;
providing a box having a plurality of panels and a plurality of fold-over flaps, one of said fold-over flaps having an opening that is defined in part by an edge with a polygon shape;
attaching said bag to said flange;
inserting the polygon portion of said fitment into said flap opening; and
folding together said plurality of fold-over flaps to complete the closure of said box.

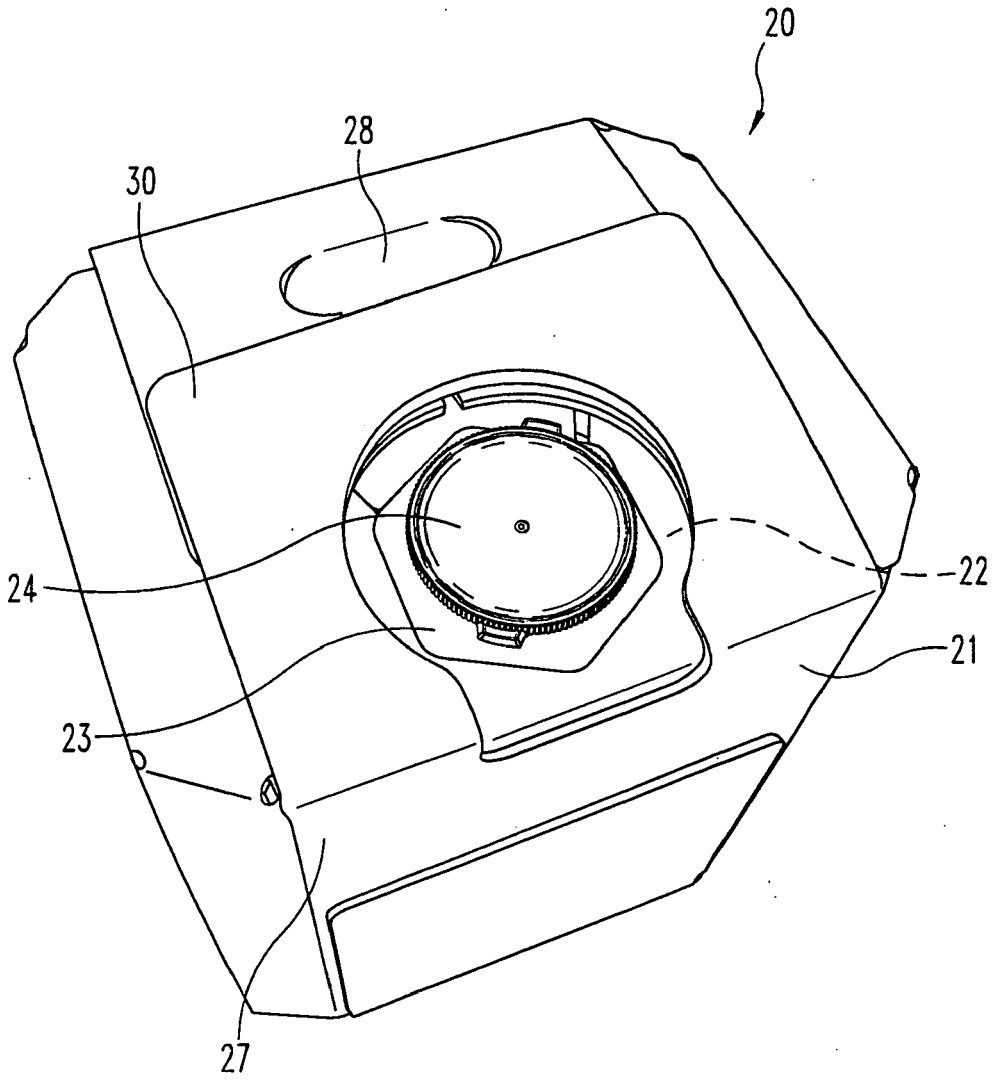

Fig. 1

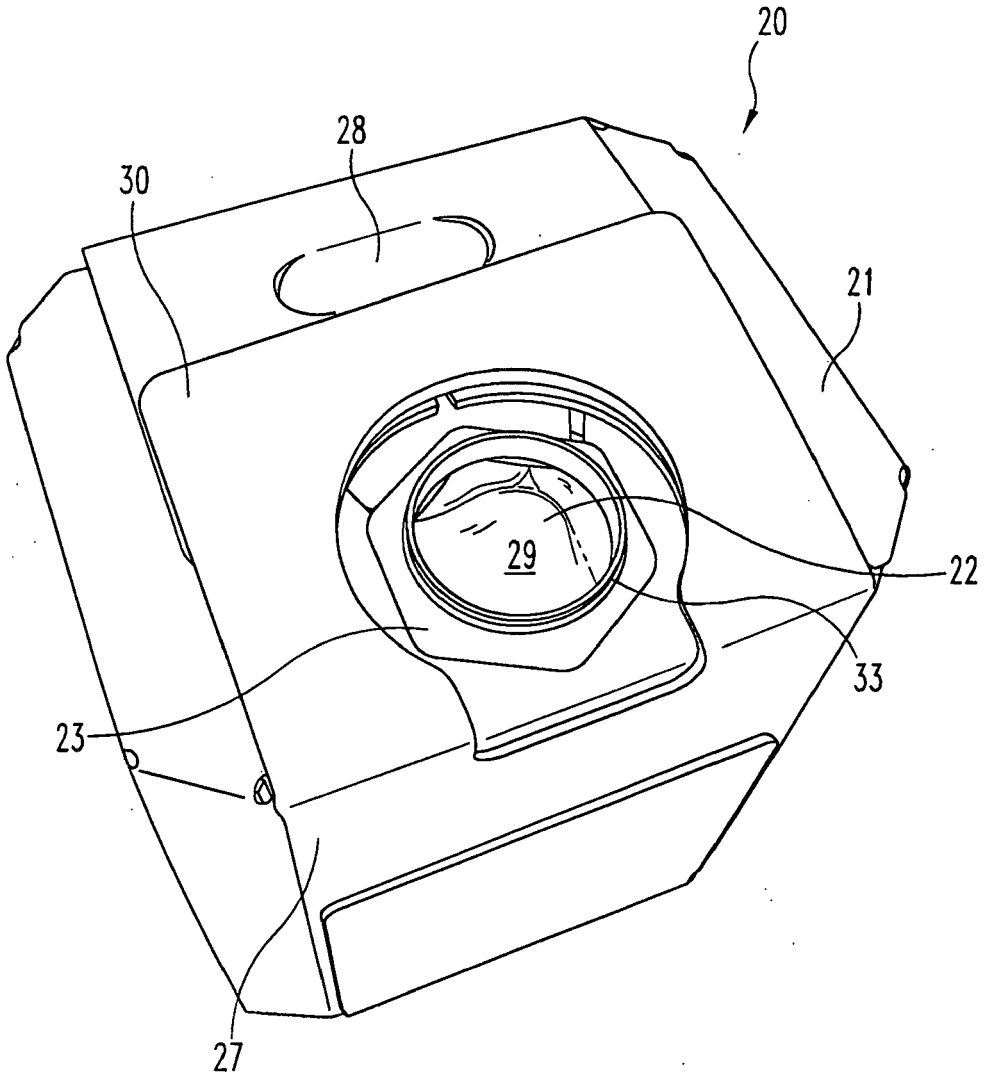

Fig. 2

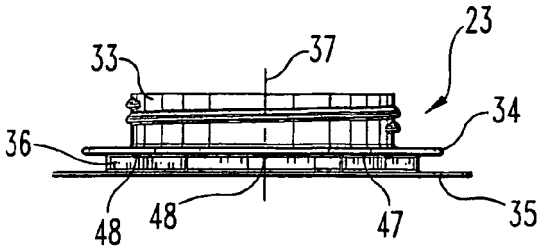

Fig. 3

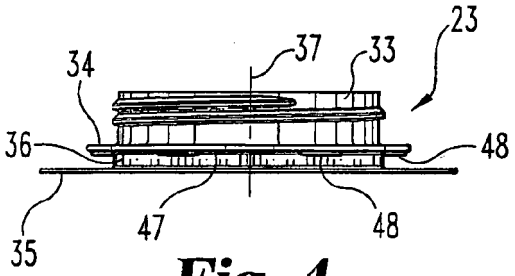

Fig. 4

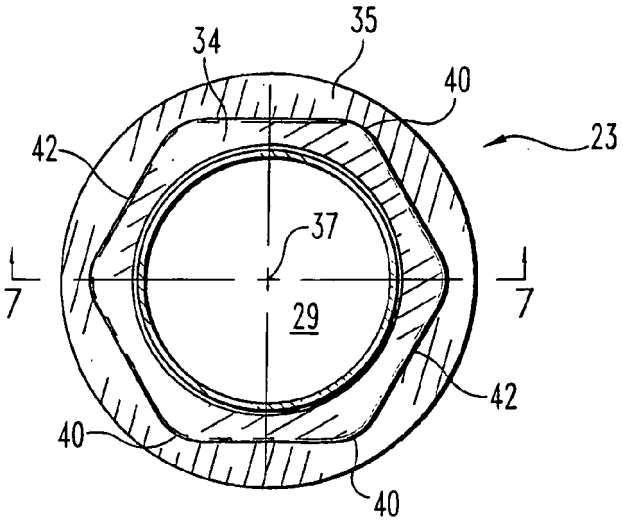

Fig. 5

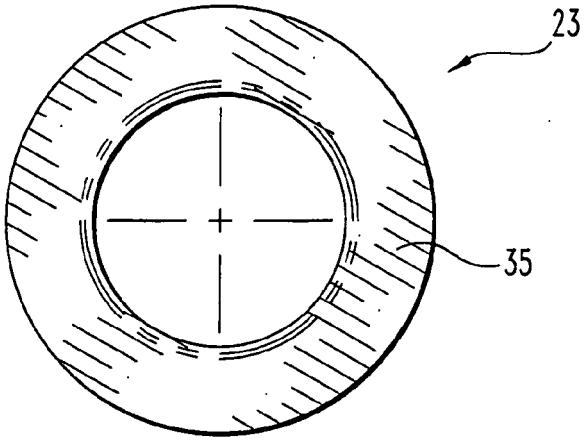

Fig. 6

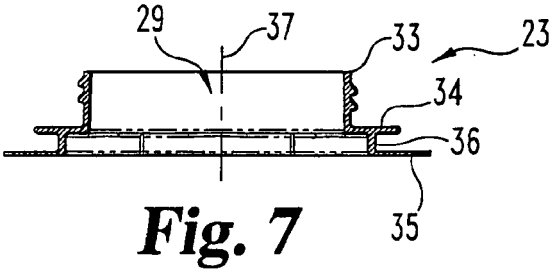

Fig. 7

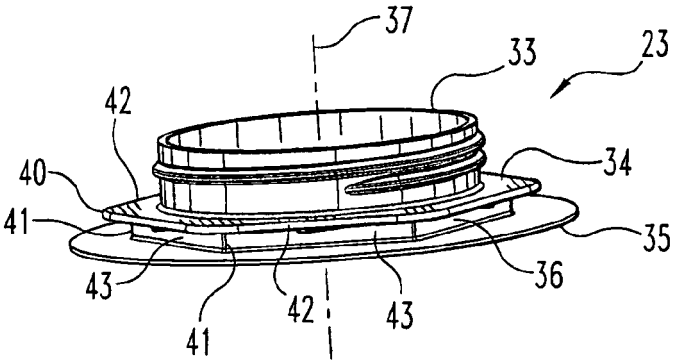

Fig. 8

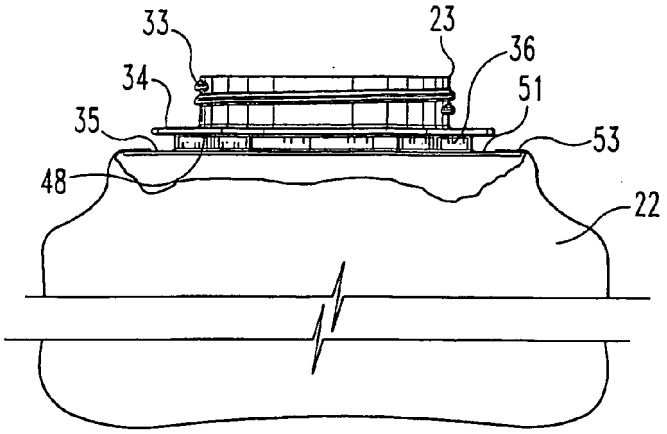

Fig. 9

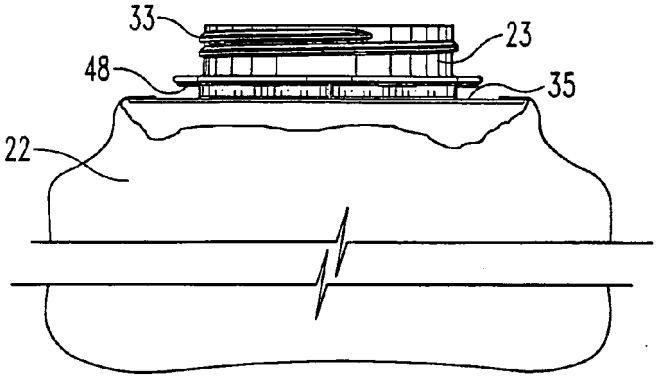

Fig. 10

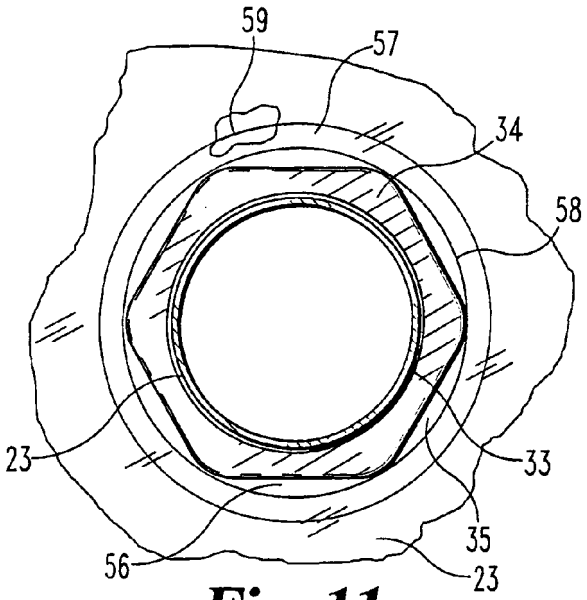

Fig. 11

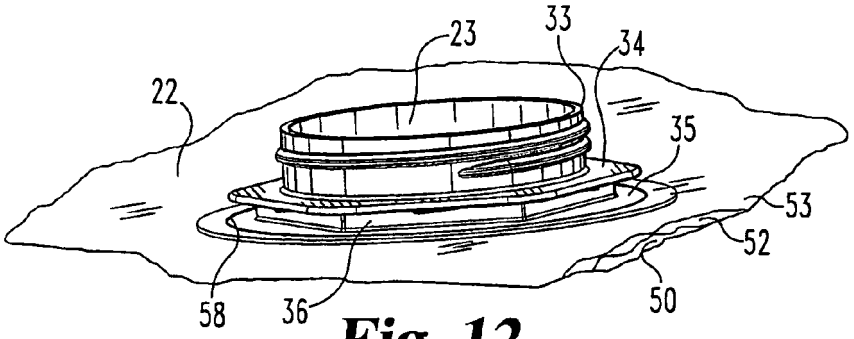

Fig. 12

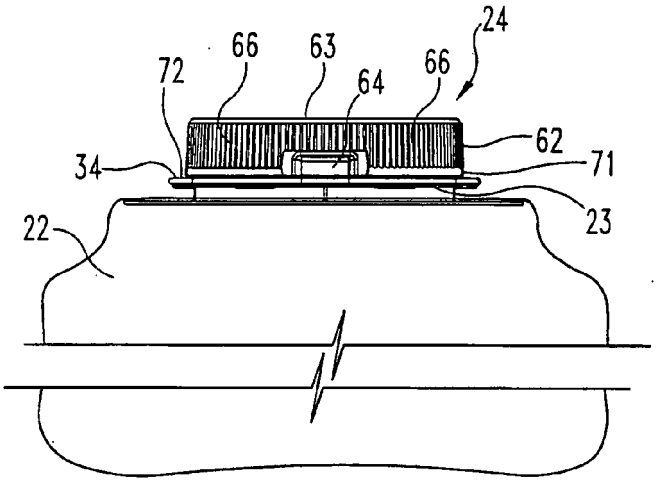

Fig. 13

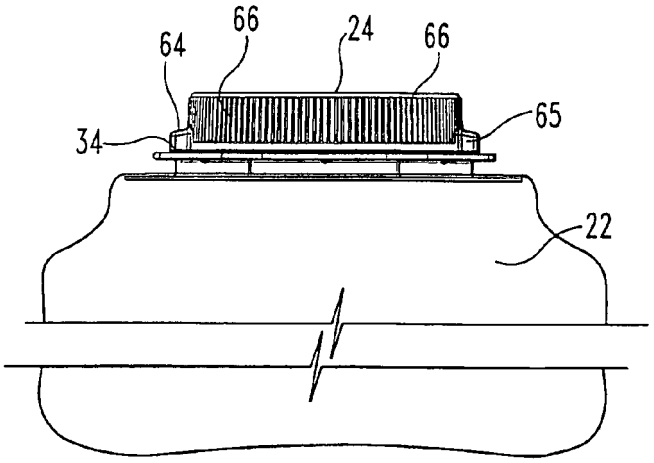

Fig. 14

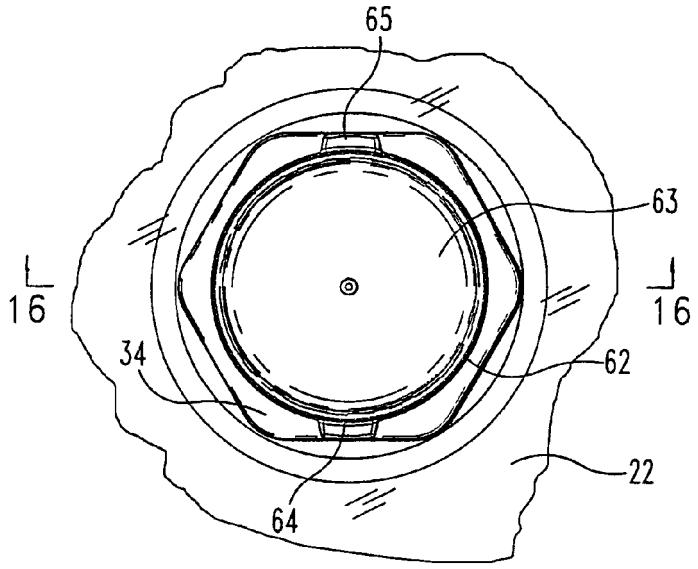

Fig. 15

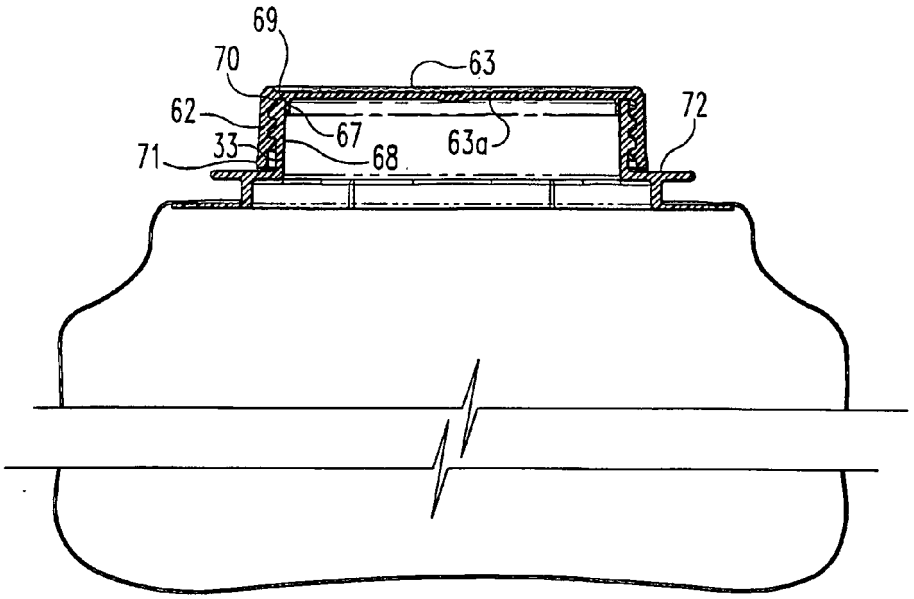

Fig. 16

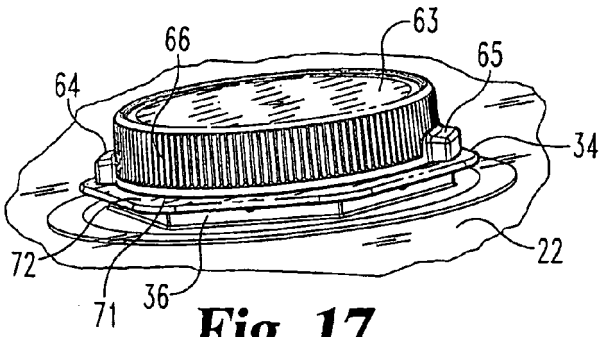

Fig. 17

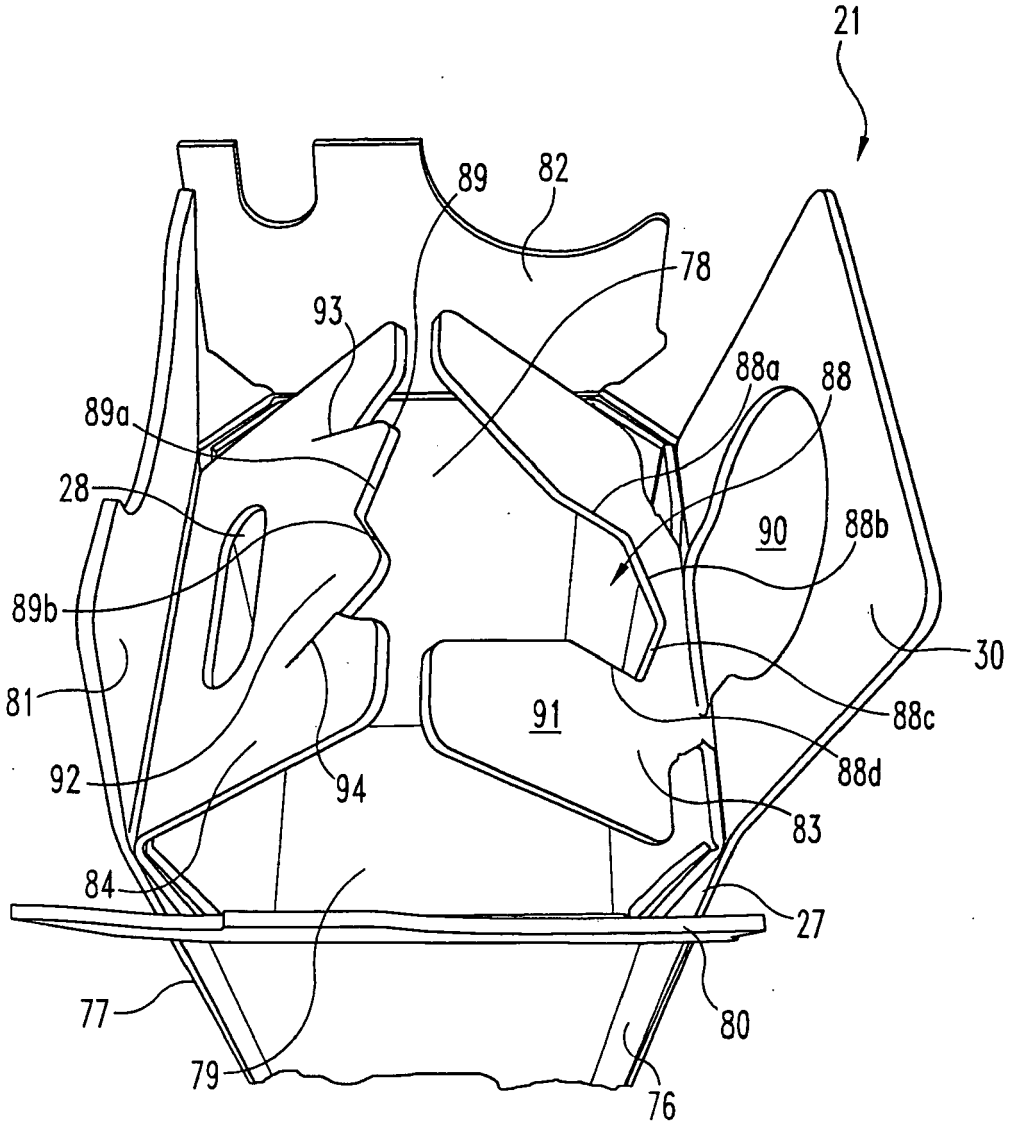
21
89
82
78
93
88a
88
89a
28
90
88b
89b
30
81
91
88c
88d
92
94
83
84
27
77
80
79
76

Fig. 18

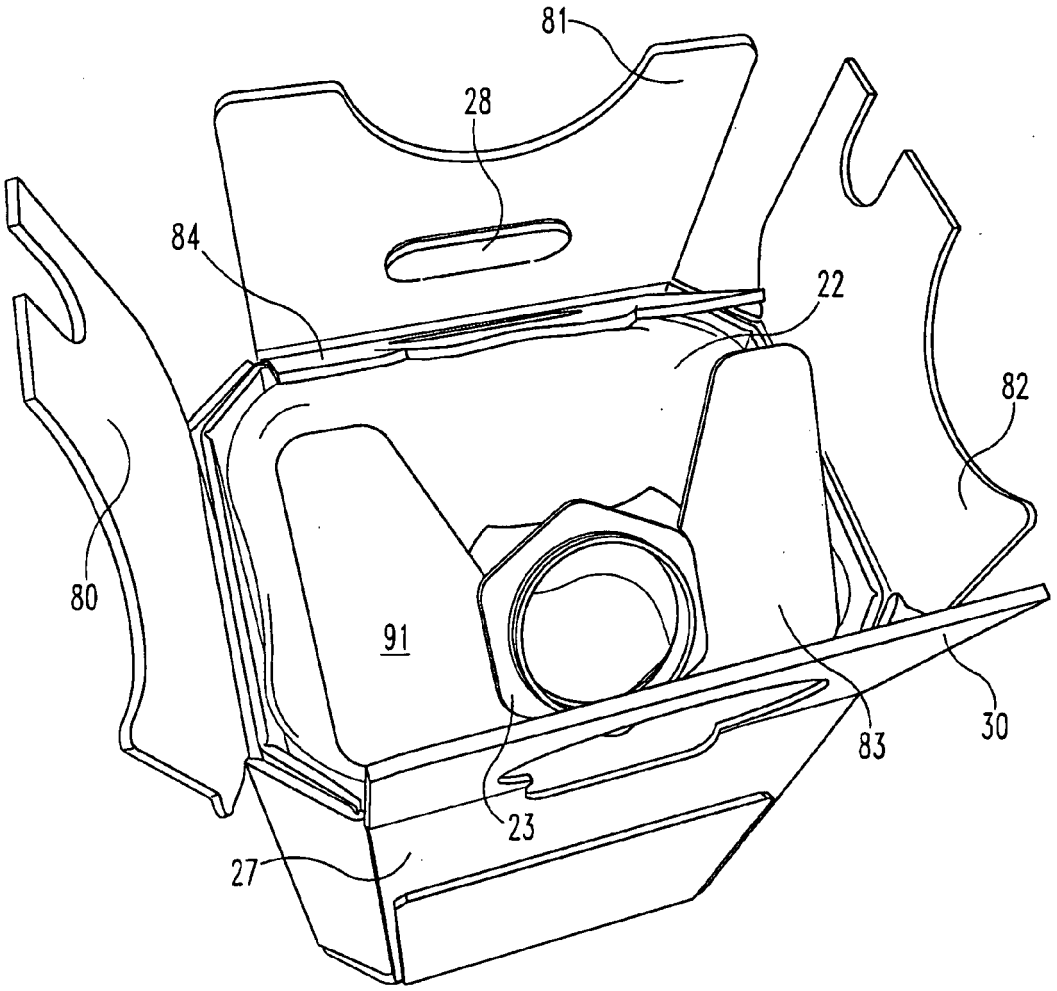

Fig. 19

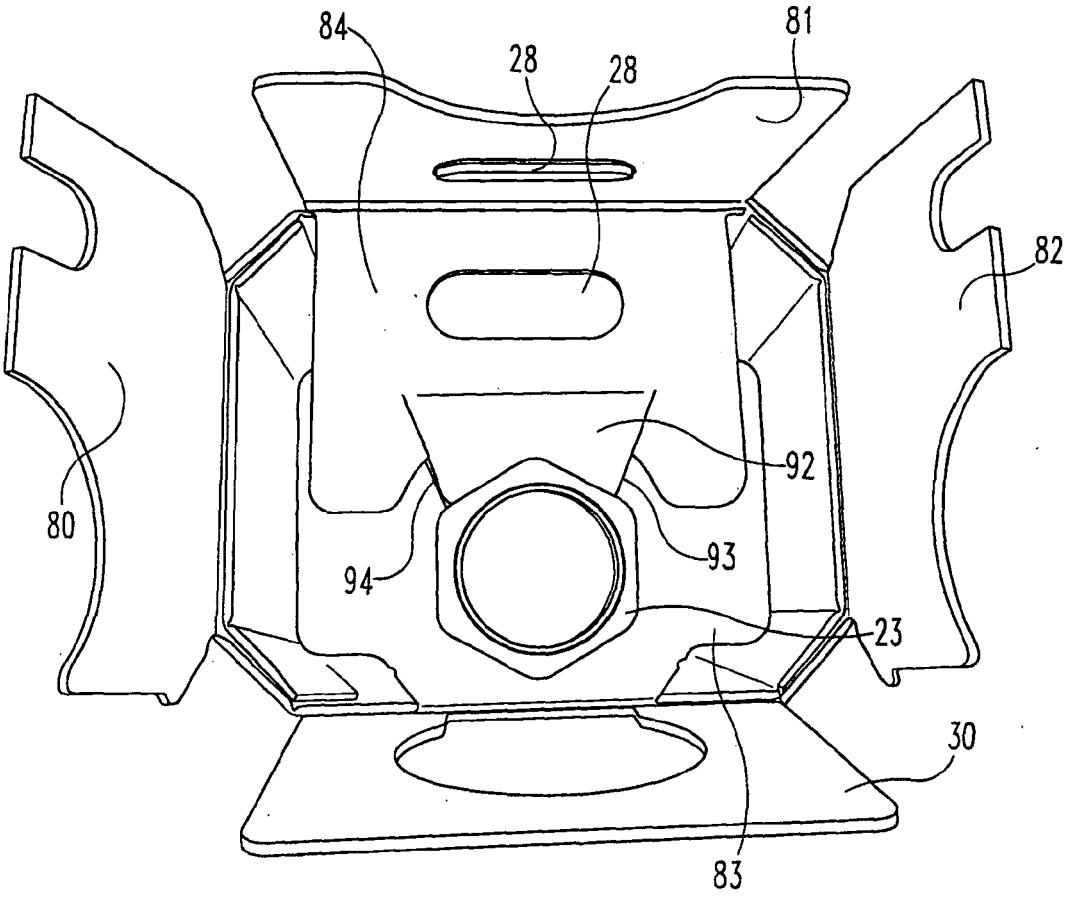

Fig. 20

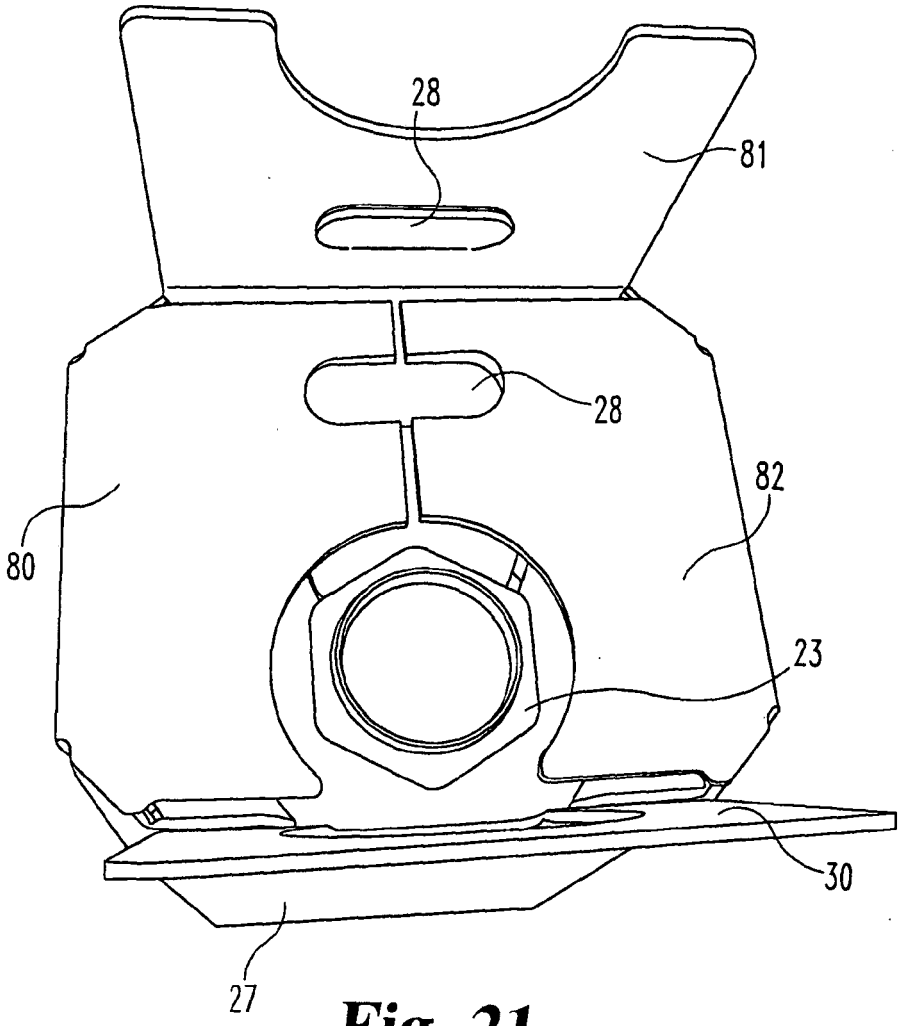

Fig. 21

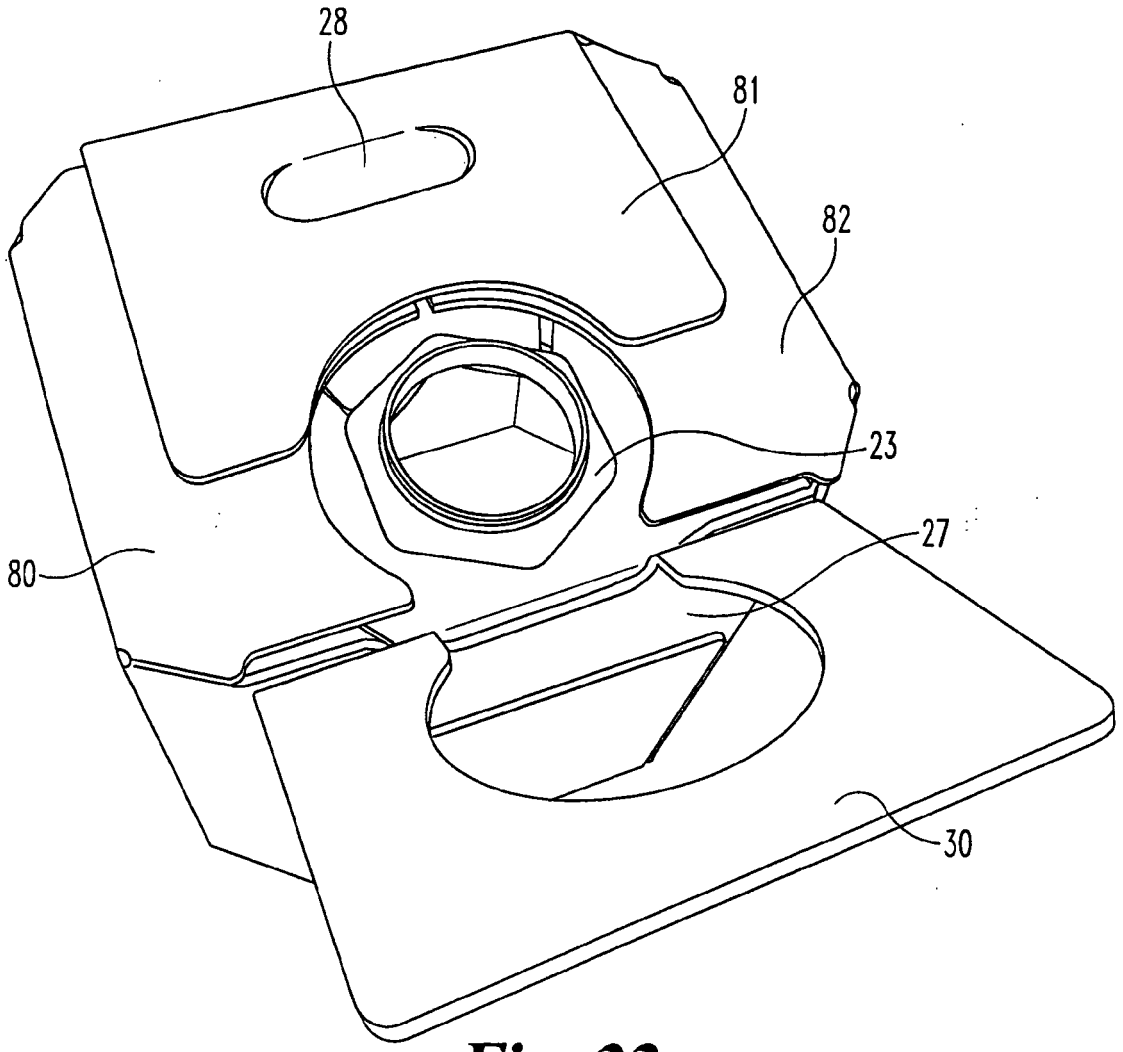

Fig. 22