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(54) **Pressure control fill valve**

(57) A fill valve (10) for filling and sealing of a pressurized dispensing container, as well as for allowing the release of pressure from a container to prevent over pressurization. The valve (10) may include a generally cylindrical body having a first end (12) and a second end (14). The fill valve (10) prevents over pressurization of a dispensing container by releasing pressure at a desired maximum point and then stopping the leakage of pressure at a desired minimum point.

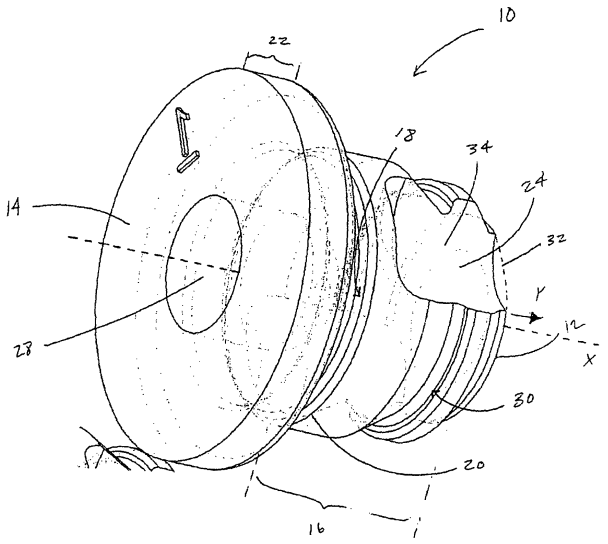

Fig. 4

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of the filing date of United States Provisional Patent Application No. 60/840,215 filed August 25, 2006, the disclosure of which is hereby incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to a valve for a pressurized dispensing container, and more particularly to a valve allowing for the release of pressure from a container to prevent over pressurization.

[0003] It is well known in the art to utilize pressurized cans for dispensing products such as lotions and creams, for example, shaving cream. Generally these cans contain a chamber containing product, for example shaving cream, and a chamber of pressurized gas adapted to expel the product out of the container. It has been the practice to charge a container of this type with a pressurized gas subsequent to placing the product in the container. Typically, a separate opening in the bottom of the container is utilized to introduce the propellant into the propellant chamber, and a plug or fill valve is thereafter quickly inserted to close the opening and maintain the pressure level of the propellant. Over the years, several advances in this process have occurred.

[0004] One such advance includes the use of a two-position plug or fill valve for performing this process. This two-position fill valve includes flutes on the side of the valve to provide access to the container when the plug is in a first position. A fill valve of this type is disclosed in U.S. Patent 3,522,900 to Nicholson, the disclosure of which is hereby incorporated herein by reference. FIGS. 1-3 illustrate the use of this two-position fill valve.

[0005] As shown in FIG. 1, the two-position fill valve initially is inserted into the container to a first position. This insertion typically is done at the facility where the container is manufactured. The container with the valve inserted then is transported to a filling facility. As shown in FIG. 1, the flutes within the two-position fill valve provide an opening into the container. At the filling facility, the container is pressurized through the flutes, as shown in FIG. 2. Thereafter, as shown in FIG. 3, the valve is further inserted into the container to a second position where the valve seals the container.

[0006] The foregoing sets forth the use of a basic fill valve. Of course, variations of such use do exist, as do other valves which improve upon their predecessors. For example, U.S. Patent No. 6,945,284 to Hurd et al., the disclosure of which is hereby incorporated herein by reference, teaches an improved dispensing container fill valve. This design not only addresses the propensity of previous valves to become dislodged from a container during shipping or the like, but also improves upon the filling rate during charging of the container.

[0007] An often encountered problem with utilizing a fill valve is the over pressurization of the container. For example, containers exposed to extreme heat during transport, storage, or the like often become over pressurized. Over pressurization may be a safety hazard because it may cause the container to fail or explode. Past fill valve designs have not allowed for the release of pressure to avoid over pressurization, partly because any release in pressure could have been harmful to the environment through the release of hydrocarbons. Recently, however, the use of non-hazardous compressed gases as propellants has lessened this threat.

[0008] Therefore, there exists a need for an improved fill valve that prevents over pressurization of a dispensing container.

SUMMARY OF THE INVENTION

[0009] The present invention addresses this need by providing a fill valve that releases pressure once a desired maximum pressure point is achieved in the container, and then stops the leakage of pressure once the pressure drops below that point. A first aspect of a preferred embodiment of the present invention is a pressure control fill valve including a generally cylindrical body having a longitudinal axis, a first end, and a second end. The body has a first section extending from said first end toward said second end and defining at least one circumferential groove. The first section also defines at least one flute where the at least one flute defines a fill arc and a fill area when the pressure control fill valve is disposed in a dispensing container opening for filling the dispensing container and releasing pressure therefrom. The body also includes a base defining a cavity, the cavity extending from the base inwardly toward the first end and a flexible wall disposed between the flute and the cavity that deforms upon the application of a suitable pressure to the first section of the body and reverts substantially to its original position upon a drop in pressure below the suitable pressure.

[0010] A second aspect of a preferred embodiment of the present invention is another pressure control fill valve including a generally cylindrical body having a longitudinal axis, a first end, and a second end. The body has a first section extending from said first end toward said second end and defining at least one circumferential groove. The first section also defines at least one flute where the at least one flute defines a fill arc and a fill area when the pressure control fill valve is disposed in a dispensing container opening for filling the dispensing container and releasing pressure therefrom, where the fill area is greater than 15.0% of the total area of the opening. The body also includes a base defining a cavity, the cavity extending from the base inwardly toward the first end and a flexible wall disposed between the flute and the cavity that deforms upon the application of a suitable pressure to the first section of the body and reverts substantially to its original position upon a drop in pressure below the

suitable pressure.

[0011] A third aspect of a preferred embodiment of the present invention is a dispensing container. In accordance with one embodiment of this third aspect, the container includes a container body including a propellant chamber and an opening for fluid communication with the propellant chamber and a pressure control fill valve disposed within the opening. The pressure control fill valve is preferably capable of deforming to open the opening upon build up of a maximum pressure in the propellant chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Figure 1 illustrates a prior art two-position fill valve inserted in a first position in a dispensing container.

[0013] Figure 2 illustrates the prior art two-position fill valve of Figure 1 during charging of the dispensing container with pressurized gas while the two-position fill valve is in the first position.

[0014] Figure 3 illustrates the prior art two-position fill valve of Figure 1 within the container to seal the dispensing container following charging with the pressurized gas.

[0015] Figure 4 is a perspective view of a fill valve according to one embodiment of the present technology.

[0016] Figure 5 is a side cross sectional view of the fill valve of Figure 4, shown inserted in a container.

[0017] Figure 6 is a perspective view of a fill valve according to another embodiment of the present technology.

[0018] Figure 7 is a side cross sectional view of the fill valve of Figure 6, shown inserted in a container.

[0019] Figure 8 is another perspective view of the fill valve of Figure 6.

[0020] Figure 9A is a partial schematic cross sectional view of a container with the fill valve of Figure 4 inserted in the bottom thereof.

[0021] Figure 9B is a partial schematic cross sectional view of a container with the fill valve of Figure 6 inserted in the bottom thereof.

DETAILED DESCRIPTION

[0022] Referring to the drawings, wherein like reference numerals represent like elements, there is shown in Figures 4-8, two preferred embodiments of the present invention. These embodiments provide fill valves that prevent over pressurization of a dispensing container or canister by releasing pressure at a desired maximum point and then stopping the leakage of pressure at a desired minimum point. Figures 4 and 5 show the first embodiment of a fill valve 10 in accordance with the present invention. Fill valve 10 is preferably of unitary construction and formed from a deformable material, which, in a preferred embodiment may be nitrile. Other materials, however, can be utilized in constructing fill valve 10 such that fill valve 10 can be deformable for insertion into an opening of a pressurized can and exhibit the properties necessary to allow the aforementioned pressure release. This is discussed more fully below.

[0023] As shown in Figure 4, fill valve 10 has a generally cylindrical body about an axis X, a first end 12, and a second end 14. Fill valve 10 is preferably adapted for insertion into a generally cylindrical opening in a pressurized dispensing container, in an insertion direction Y. Fill valve 10 includes a first section 16 that includes a circumferential groove 18, an outwardly extending lip 20, , two flutes 24 (one of which is seen in Fig. 4), and a wall 26 (shown in Fig. 5). Valve 10 also includes a base 22 connected to or formed integral with first section 16. A cavity 28 is provided through base 22 and at least part of first section 16.

[0024] As shown, first section 16 extends from first end 12 towards second end 14, tapering outwardly along at least a portion of its length from a smaller diameter at first end 12 to a larger diameter where it meets base 22. First section 16 includes lip 20, after which the diameter of first section 16 decreases to define circumferential groove 18. Circumferential groove 18 is essentially a ridged or shouldered section adapted for securing fill valve 10 within the opening of a dispensing container. In the embodiment shown in Figures 4 and 5, a second circumferential groove 30 is also provided in first section 16, similar to groove 18. In this embodiment, second circumferential groove 30 secures fill valve 10 in a first position within the opening of a dispensing container, thereby maintaining the position of fill valve 10 in the opening of the container during filling of the container. In other embodiments, first section 16 may include additional circumferential grooves or only one such circumferential groove.

[0025] Base 22 is preferably a substantially circular portion with a diameter greater than that of the first section 16. Base 22 can be any shape or size suitable for sealing the opening of a dispensing container. Base 22 is preferably connected to first section 16 at or near circumferential groove 18 and can form a part of groove 18. In operation, the wall of a container surrounding the fill opening is contained within circumferential groove 18 such that base section 22 seals the opening when fill valve 10 is fully seated.

[0026] The embodiment shown in Figures 4 and 5 further includes a cavity 28 and flutes 24. Cavity 28 is preferably a cylindrical hole that extends from second end 14 through the interior of fill valve 10 towards first end 12. Other shapes may also be employed. In a preferred embodiment cavity 28 does not extend all the way through first section 16 to first end 12. Cavity 28 aids in the placement of fill valve 10 within a container and in the manipulation of fill valve 10 with respect to the container, allowing the release of pressure from inside the container.

[0027] While the embodiment shown in Figures 4 and 5 includes two flutes 24, the present technology may include one flute, or a plurality of flutes, thereby promoting a more even and predictable collapse pressure. Flutes

24 preferably define passages that are useful during a fill process and which allow pressure to escape when wall 26 deforms to slightly unseat fill valve 10 from a sealed position in the opening of a container. The dimensions of flutes 24 are defined by the fill arc length and fill area 34. The fill arc length is defined as the total length of removed arcs 32. Fill area 34 is defined as the total area of the plane perpendicular to axis X surrounded by flutes 24 and the border of the opening of the container. Fill area 34 provides two passageways into the dispensing container for filling the dispensing container with pressurized gas or other material and releasing pressure upon over pressurization of the container.

[0028] In the embodiment shown in Figures 4 and 5, wall 26 (best shown in Figure 5) is disposed between flutes 24 and cavity 28. The thickness, and related stiffness, of wall 26 can be varied depending on the size and dimensions of cavity 28. In a preferred embodiment, when a maximum pressure exerts a force on first section 16 of fill valve 10, wall 26 deforms, causing a temporary collapsing of first section 16. This collapse of first section 16 changes the orientation of circumferential groove 18, allowing partial displacement of fill valve 10 within the opening of the container. Accordingly, flutes 24 form a channel from the inside of the container to the outside of the container to release pressure from inside the container. When a minimum pressure is reached within the container, the pressure force on first end 12 is relieved and wall 26 reverts to its original position. Circumferential groove 18 then returns to its original orientation and fill valve 10 reseats, with base 22 once again sealing the opening of the container.

[0029] In the embodiment shown in Figures 4 and 5, for an opening in a container of 0.210 inches, preferably, first section 16 has a diameter at first end 12 of approximately 0.183 inches and a diameter at lip 20 of approximately 0.260 inches. Circumferential groove 18 has a diameter of approximately 0.240 inches. Base 22 has a diameter of approximately 0.343 inches. Cavity 28 has a diameter of approximately 0.127 inches. It is contemplated, however, that different sized and shaped fill valves can be utilized depending on the application, the canister, the fill hole size, etc. For example, an increase in the size of the container opening will facilitate the need for an increased sized fill valve 10. Of course, the variation of one or more dimensions may require similar variations of others.

[0030] Figures 6-8 depict fill valve 100 in accordance with another embodiment of the present technology. As best shown in Figure 6, fill valve 100 is also a generally cylindrical body having a first end 112 and a second end 114. In the embodiment shown, fill valve 100 includes a first section 116 which includes a circumferential groove 118, an outwardly extending lip 120, two flutes 124 defined by fill arc lengths and fill areas 134, and a wall 126. A base 122 and a cavity 128 are also provided. This second embodiment is substantially similar to fill valve 10, however, it includes a larger cavity 128. Like reference numerals for like elements to those of the first embodiment have been utilized, but with a 100-series of numbers. Operation and use of valve 100 is also preferably substantially similar to that of valve 10.

[0031] Preferably, for an opening in a canister of 0.210 inches, first section 116 of fill valve 100 has a diameter at first end 112 of approximately 0.183 inches and a diameter at lip 120 of approximately 0.260 inches. Circumferential groove 118 has a diameter of approximately 0.240 inches. Base 122 has a diameter of approximately 0.343 inches. Cavity 128, however, has a diameter of approximately 0.160 inches. It is again contemplated that different sized and shaped fill valves can be utilized. For example, an increase in the size of the container opening will facilitate the need for an increased sized fill valve 100.

[0032] Fill valves 10 and 100 provide an improved fill valve that prevents over pressurization of a dispensing container by releasing pressure at a desired maximum point and then stopping the leakage of pressure at a desired minimum point. Figures 9A and 9B show the first and second embodiments, respectively, when inserted into the base of dispensing containers. While these embodiments are illustrative, it is contemplated that other embodiments may prevent over pressurization of dispensing containers by varying the profile, diameter, depth, or other pertinent features of the fill valve to accommodate different dispensing containers. Accordingly, the fill valve may be used with many different kinds of containers.

[0033] As discussed above in relation to valves 10 and 100, variations in the diameters of cavities 28 and 128 preferably results in a change in the thickness and/or stiffness of wall 126, which necessarily adjusts the maximum pressure needed to deform wall 126 and temporarily collapse first section 116. Valves for use with containers openings of approximately 0.210 inches, and having cavities with diameters of 0.120 to 0.161 inches have been tested and shown to provide differing maximum pressure releases. Of course, variations in the diameter of cavities 28 and 128 necessarily results in the changes of other element sizes, for similar overall sized valves. For example, as is noted above, such results in the change in thickness of wall 126. In addition, it is noted that larger overall valve sizes may result in different cavity sizes now providing for different maximum pressures. For instance, a valve designed for use with an opening larger than 0.210 inches may include a cavity having a diameter identical to that of cavity 28. However, because of the larger overall size of the valve, the maximum pressure held by the larger valve may be greater than that of valve 10. Of course, as other elements of valves in accordance with the present invention change, this may vary.

[0034] It is also noted that the particular material utilized in forming a valve in accordance with the present invention may vary the maximum pressure capable of being held by the particular valve. For example, identically sized and configured valves may hold different max-

imum pressures when one of the valves is constructed of a stronger or stiffer material. Finally, it is noted that the length of cavities in valves in accordance with the present invention, such as cavities 28 and 128, may serve to vary the maximum pressure held by the valve in operation. For example, longer (or deeper) cavities may result in an overall reduction in material, which may make the valve weaker and subject to being deformed under lesser pressures.

[0035] Although the technology herein has been described with reference to particular embodiments, it is to be understood that these embodiments are merely illustrative of the principles and application of the present technology. It is therefore to be understood that numerous modifications may be made to the illustrative embodiments and that other arrangements may be devised without departing from the spirit and scope of the present invention as defined by the appended claims.

Claims

1. A pressure control fill valve comprising:

a generally cylindrical body having a longitudinal axis, a first end, and a second end, said body comprising
a first section extending from said first end toward said second end and defining at least one circumferential groove, said first section also defining at least one flute wherein said at least one flute defines a fill arc and a fill area when said pressure control fill valve is disposed in a dispensing container opening for filling the dispensing container and releasing pressure therefrom;
a base defining a cavity, said cavity extending from said base inwardly toward said first end; and
a flexible wall disposed between said flute and said cavity that deforms upon the application of a suitable pressure to the first section of said body and reverts substantially to its original position upon a drop in pressure below the suitable pressure.

2. The pressure control fill valve set forth in claim 1, wherein said circumferential groove has an outwardly extending lip.

3. The pressure control fill valve set forth in claim 1, wherein the first section includes a plurality of flutes.

4. The pressure control fill valve set forth in claim 3, wherein the first section includes two flutes symmetrically spaced approximately 180º apart about the longitudinal axis.

5. The pressure control fill valve set forth in claim 1, wherein said cavity has a diameter of 0.160 inches.

6. The pressure control fill valve set forth in claim 1, wherein said cavity has a diameter of 0.127 inches.

7. The pressure control fill valve set forth in claim 1, wherein the fill valve is constructed of nitrile.

8. The pressure control fill valve set forth in claim 1, wherein said first section is tapered outwardly along at least a portion of its length from a smaller diameter at said first end to a larger diameter at said second end.

9. A pressure control fill valve comprising
a generally cylindrical body having a longitudinal axis, a first end, and a second end, said body comprising
a first section extending from said first end toward said second end and defining at least one circumferential groove, said first section also defining at least one flute, wherein said at least one flute defines a fill arc and a fill area when said pressure control fill valve is disposed in a dispensing container opening for filling the dispensing container and releasing pressure therefrom, said fill area being greater than 15.0% of the total area of the opening;
a base defining a cavity, said cavity extending from said base inwardly toward said first end; and
a flexible wall disposed between said flute and said cavity that deforms upon the application of a suitable pressure to the first section of said body and reverts substantially to its original position upon a drop in pressure below the suitable pressure.

10. The pressure control fill valve set forth in claim 9, wherein said circumferential groove has an outwardly extending lip.

11. The pressure control fill valve set forth in claim 9, wherein the first section includes a plurality of flutes.

12. The pressure control fill valve set forth in claim 11, wherein the first section includes two flutes symmetrically spaced approximately 180º apart about the longitudinal axis.

13. The pressure control fill valve set forth in claim 9, wherein said cavity has a diameter of 0.160 inches.

14. The pressure control fill valve set forth in claim 9, wherein said cavity has a diameter of 0.127 inches.

15. The pressure control fill valve set forth in claim 9, wherein the fill valve is constructed of nitrile.

16. A dispensing container comprising:

a container body including a propellant chamber and an opening for fluid communication with the propellant chamber; and
a pressure control fill valve disposed within the opening,
wherein the pressure control fill valve is capable of deforming to open the opening upon build up of a maximum pressure in the propellant chamber.

17. The dispensing container of claim 16, wherein the pressure control fill valve can be situated in first and second positions with respect to the container body, the first position allowing for filling of the propellant chamber with a propellant, and the second position allowing for sealing of the opening.

18. The dispensing container of claim 17, wherein the pressure control fill valve includes
a generally cylindrical body having a longitudinal axis, a first end, and a second end, the body having
a first section extending from the first end toward the second end and defining at least one circumferential groove, the first section also defining at least one flute, wherein the at least one flute defines a fill arc and a fill area when the pressure control fill valve is in the first position for filling the dispensing container;
a base defining a cavity, the cavity extending from the base inwardly toward the first end; and
a flexible wall disposed between the flute and the cavity that deforms upon the build up of the maximum pressure in the propellant chamber and reverts substantially to its original position upon a drop in pressure below the maximum pressure.

19. The dispensing container of claim 16, the fill valve is constructed of nitrile.

20. The dispensing container of claim 16, wherein the fill valve is capable of reverting to is original shape upon a drop in pressure in the propellant chamber below the maximum pressure.

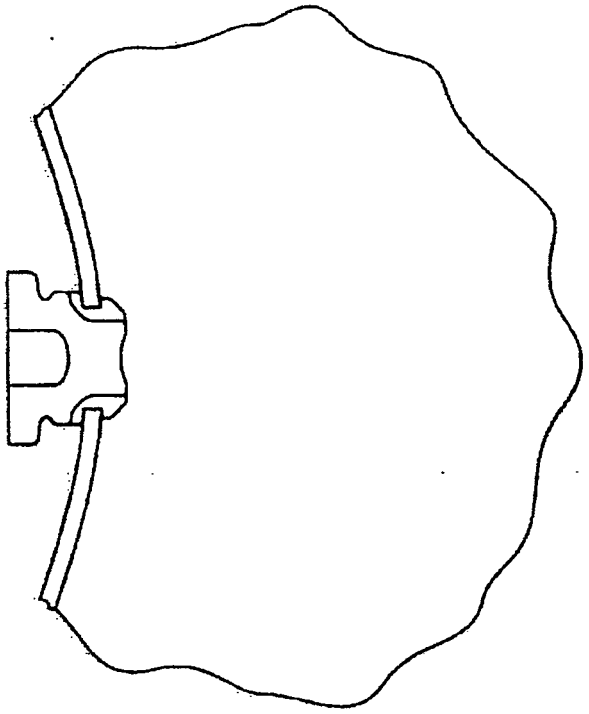

FIG. 1 Prior Art

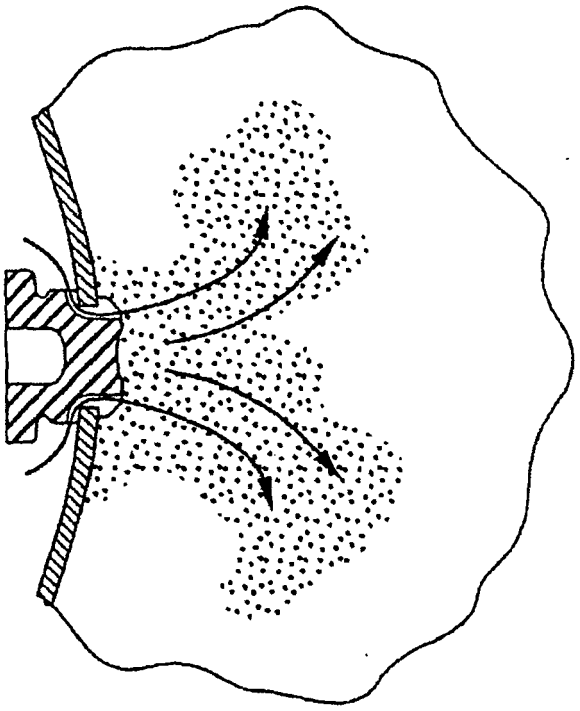

FIG. 2 Prior Art

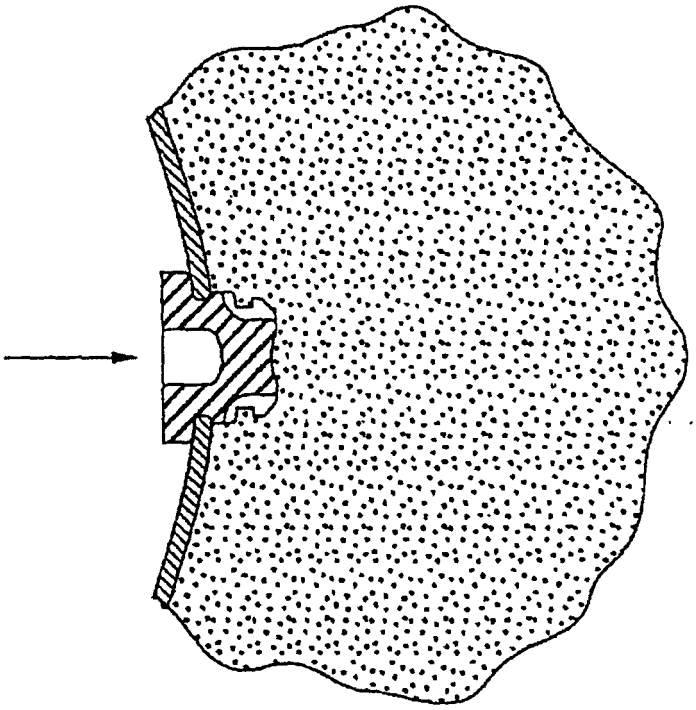

FIG. 3 Prior Art

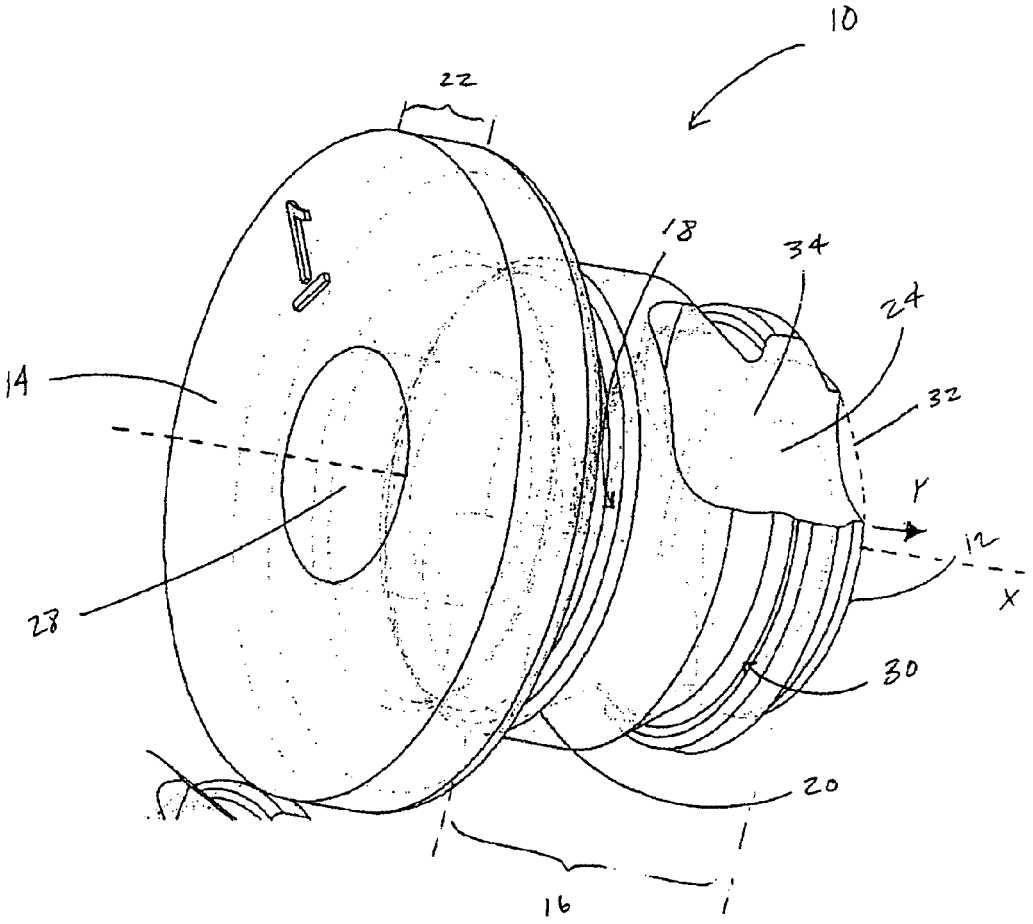

Fig. 4

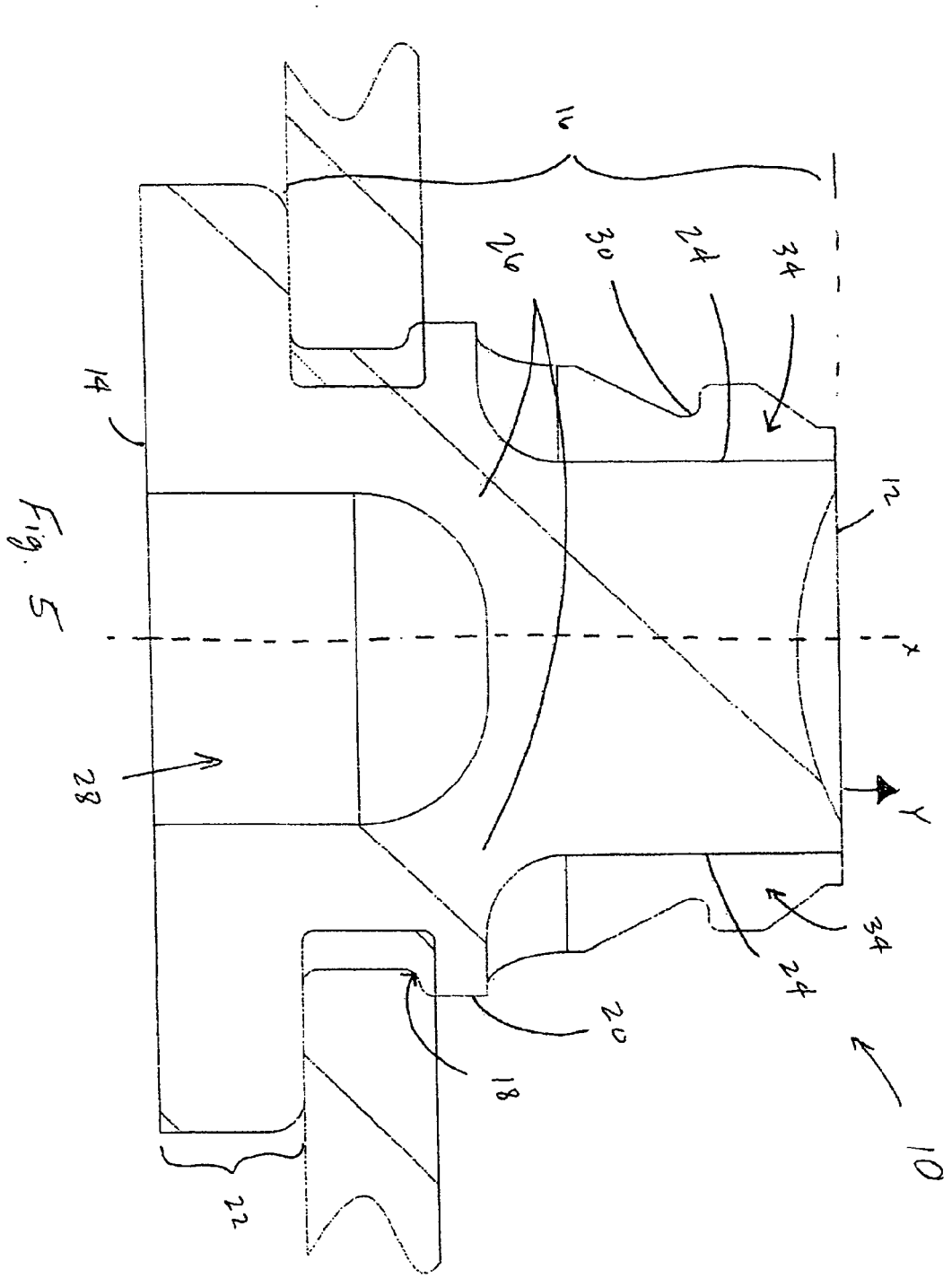

Fig. 5

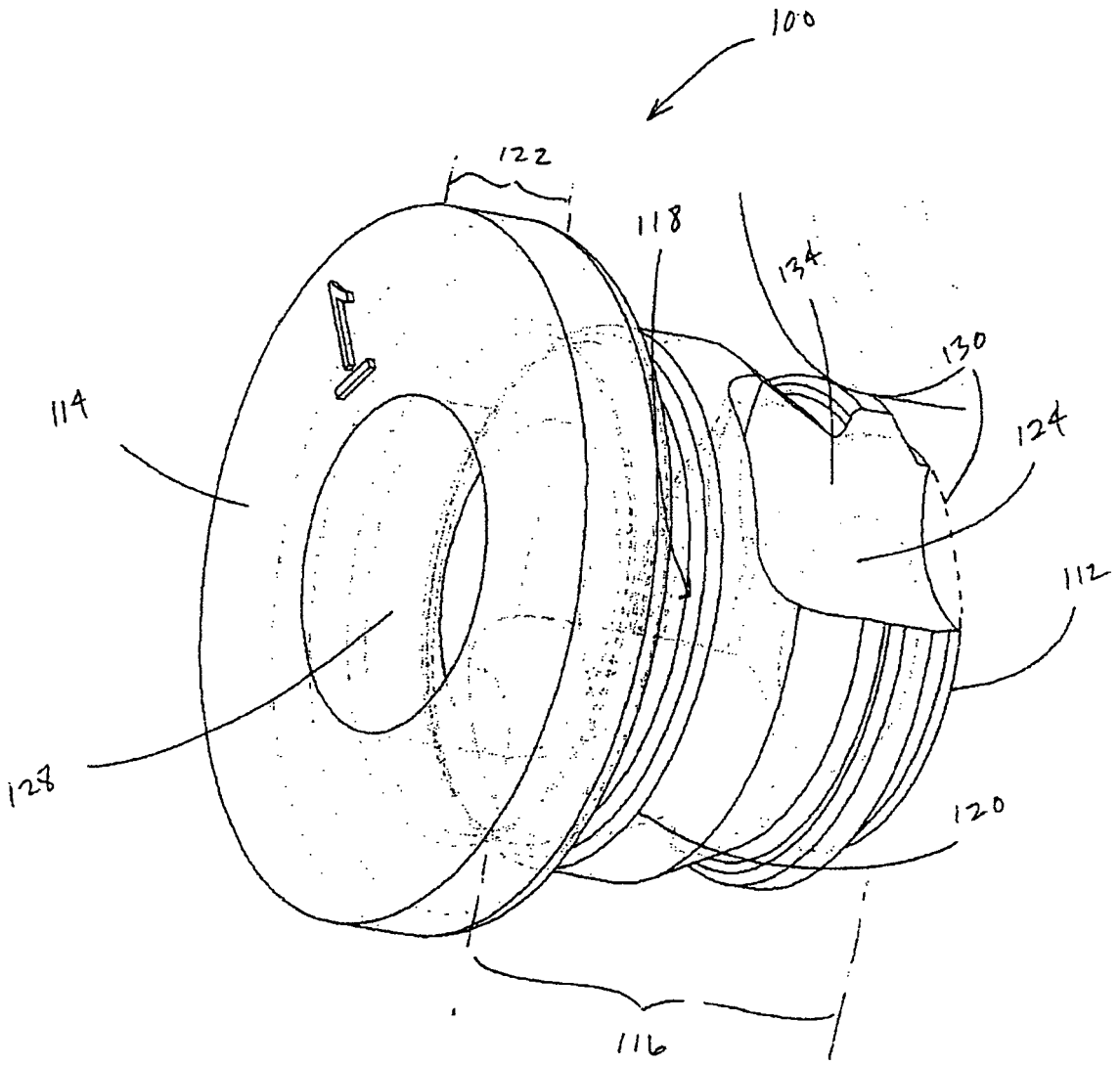

Fig. 6

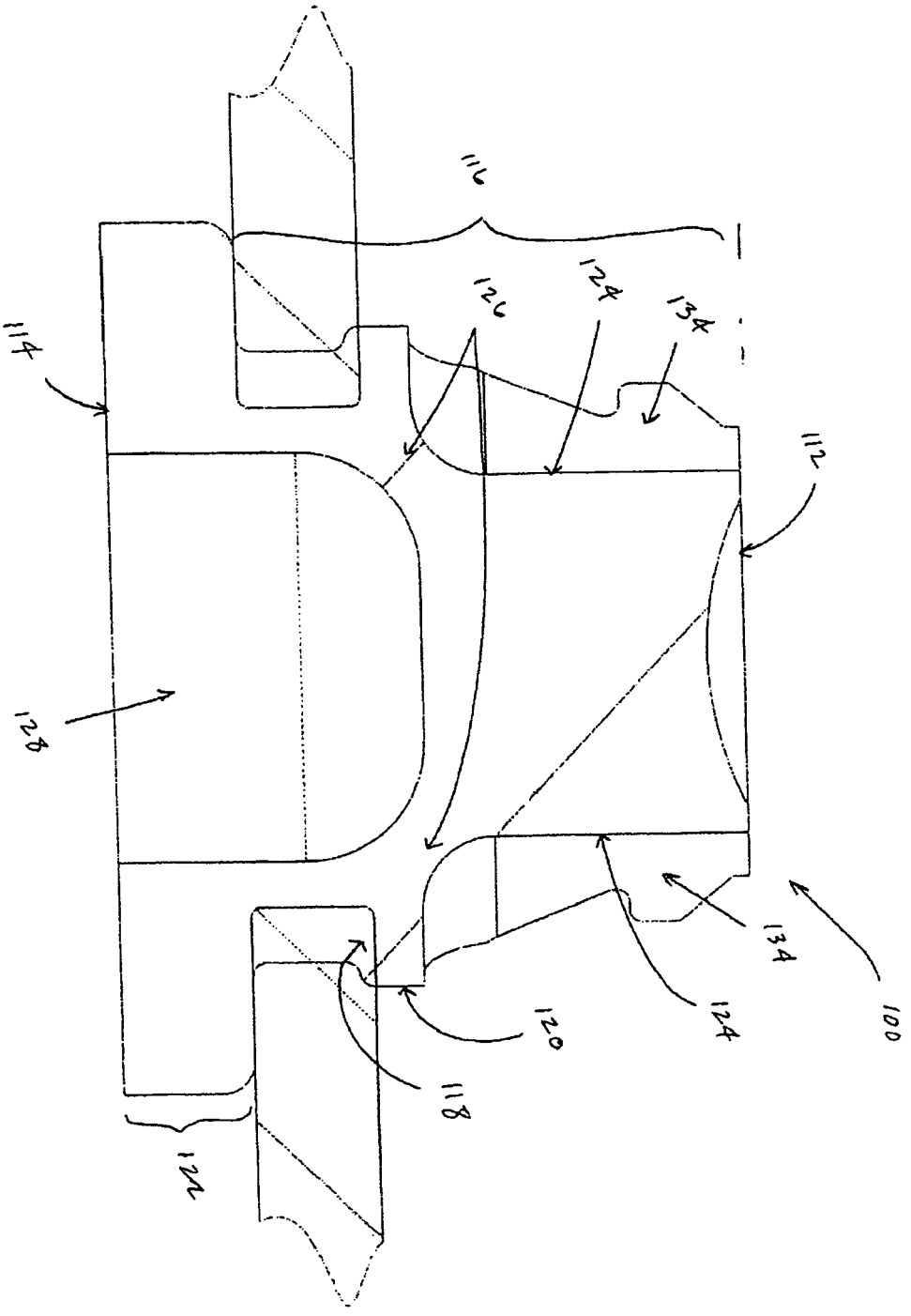

Fig. 7

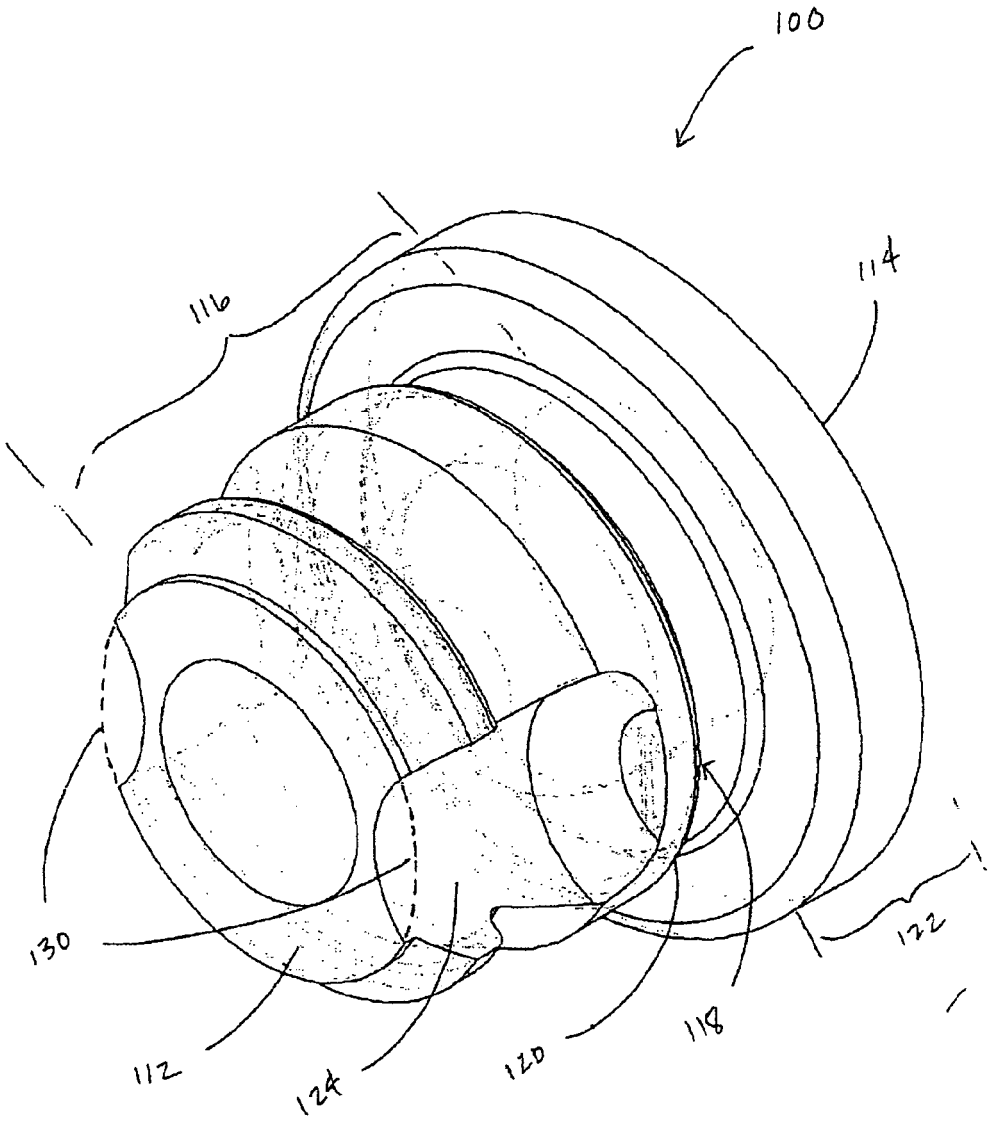

Fig. 8

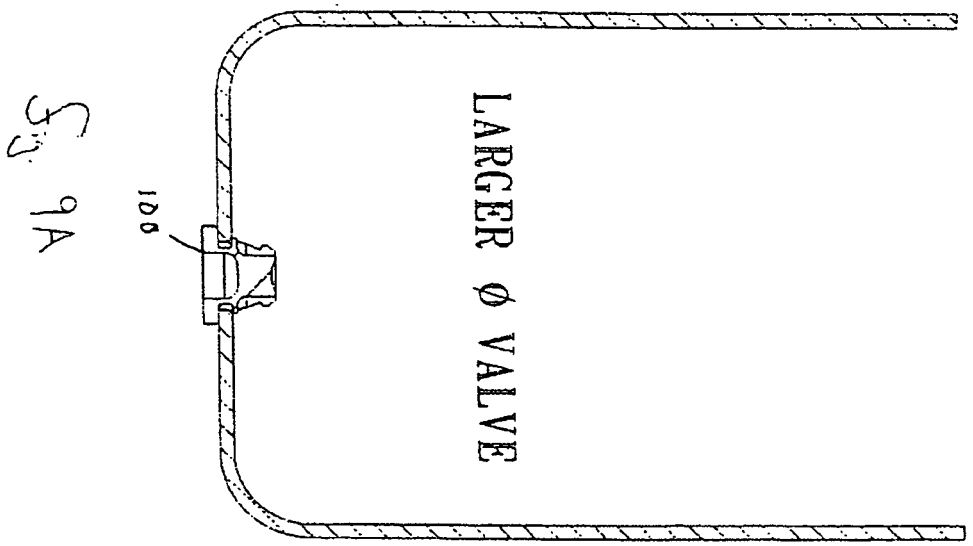

Fig. 9A

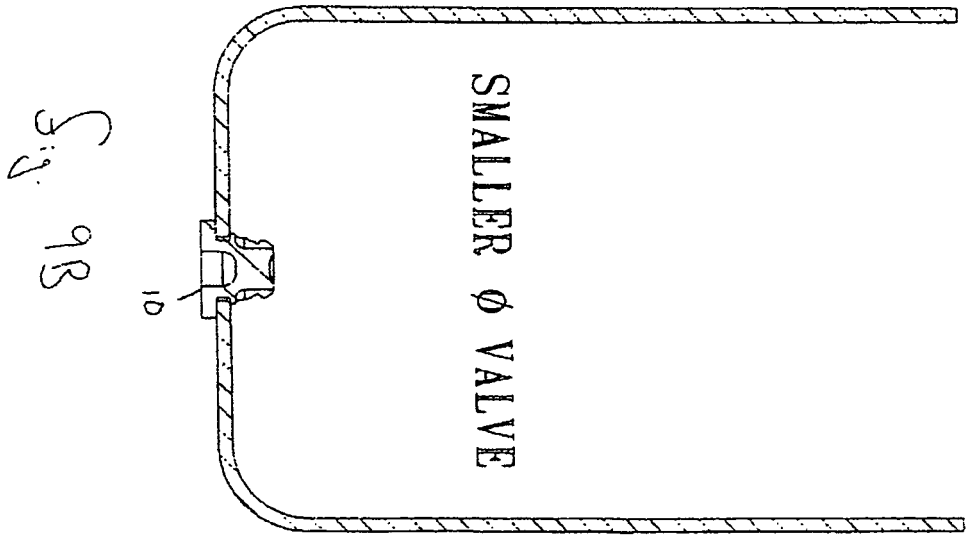

Fig. 9B

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 01 6593

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 1 499 739 A (W.BALTZER) 27 October 1967 (1967-10-27) * page 2; figure 1 *	16,17, 19,20	INV. B65D83/14
A		1	

D,A	US 6 945 284 B1 (HURD WAYNE R [US] ET AL) 20 September 2005 (2005-09-20) * claim 1; figure 4 *	1	

A	US 3 357 601 A (CRAWFORD EARLE D ET AL) 12 December 1967 (1967-12-12) * column 2, line 60 - column 3, line 10; figures 1,2 *	1	

TECHNICAL FIELDS SEARCHED (IPC)
B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 November 2007	Lostetter, Yorick

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 01 6593

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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09-11-2007

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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