

[54] **PORTAL BUSHING FOR PRODUCT CONTAINER**

3,280,421 10/1966 Davidson 401/122
3,741,666 6/1973 Vasas et al. 401/127

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[21] Appl. No.: **348,104**

[57] **ABSTRACT**

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[51] Int. Cl. **A46b 11/00**
[58] Field of Search 401/121-130

A portal bushing for use in a reservoir assembly of a product container and including means for interlocking with a reservoir body to translate the forces developed during operation of the product container without exerting continual stress.

[56] **References Cited**

UNITED STATES PATENTS

3,195,545 7/1965 Ledenberg et al. 401/122

10 Claims, 6 Drawing Figures

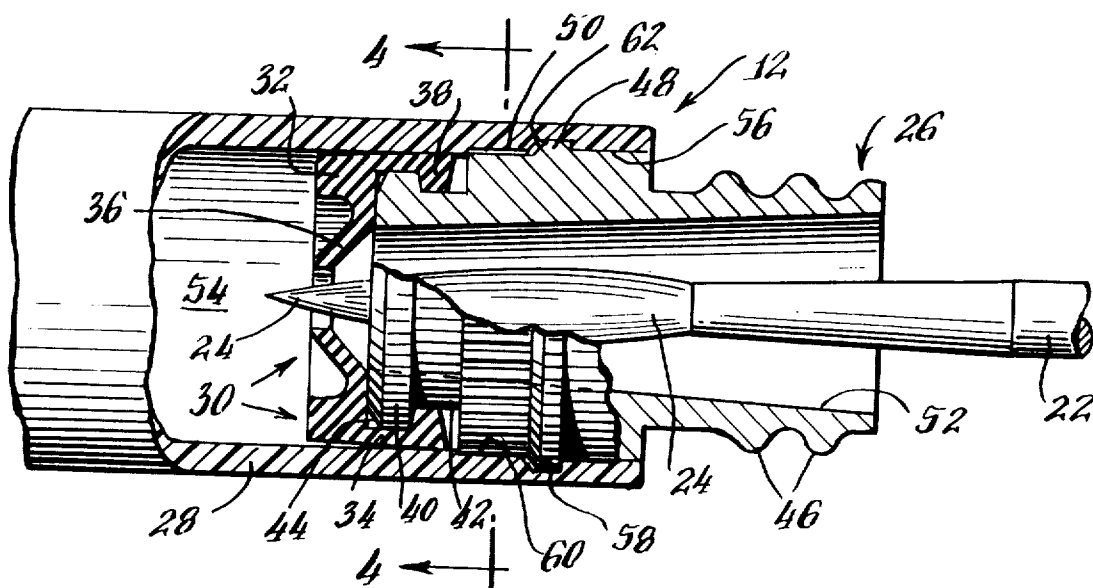


Fig. 1

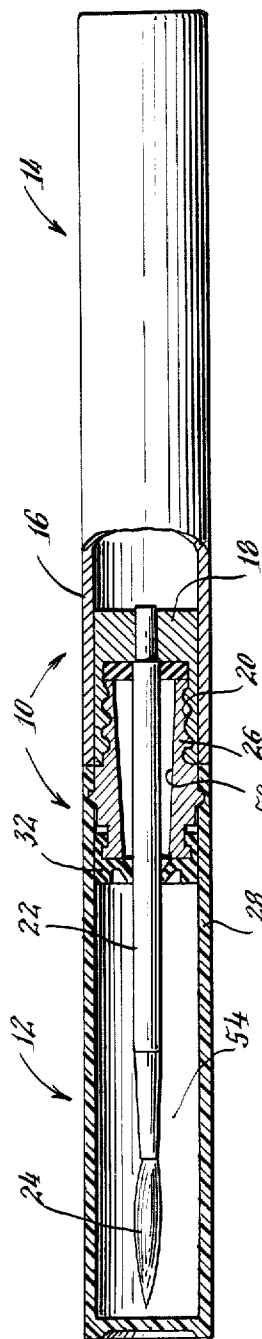


Fig. 2

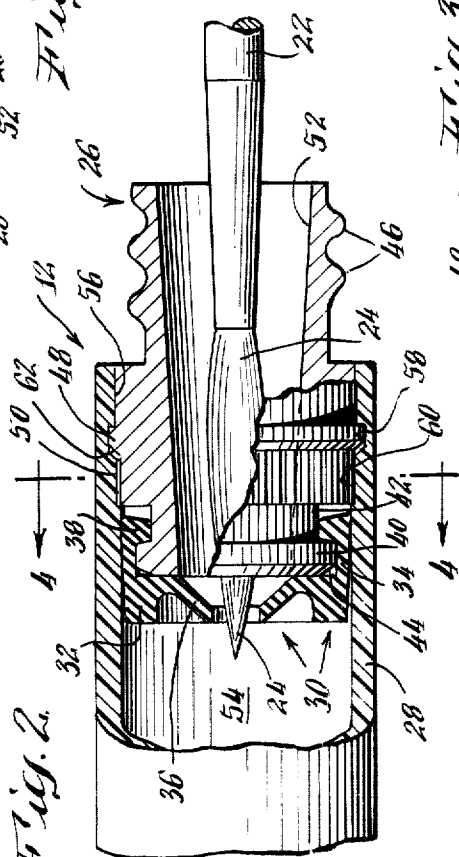


Fig. 4

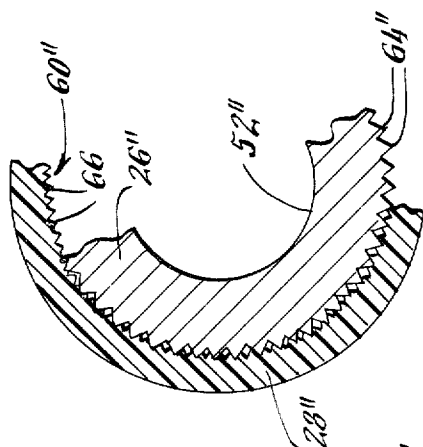
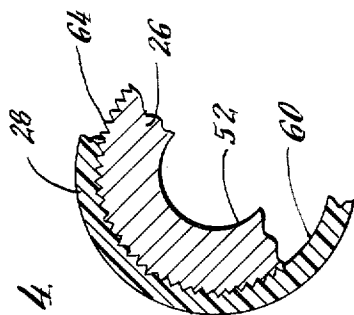


Fig. 3

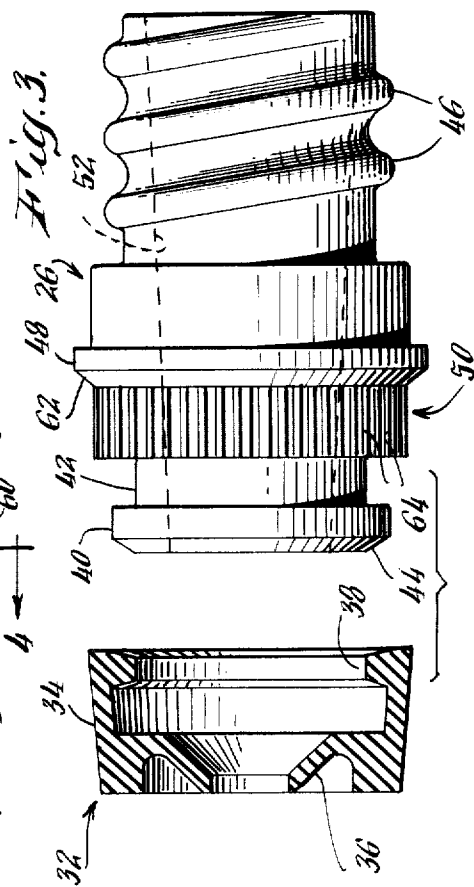


Fig. 6

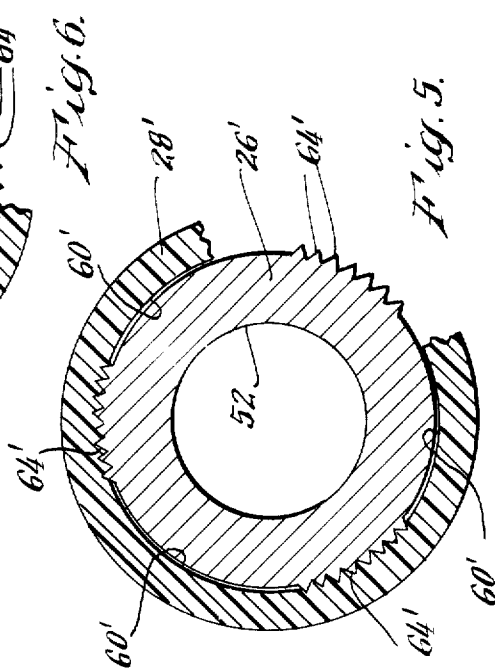
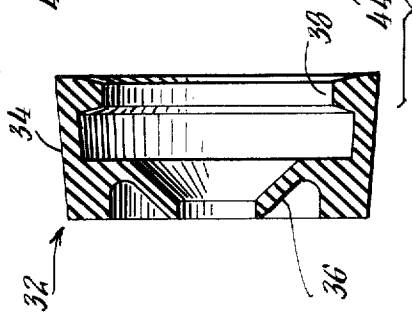


Fig. 5



PORTAL BUSHING FOR PRODUCT CONTAINER

The present invention relates to a portal bushing for use in a reservoir assembly and especially such a bushing having provisions for retaining the reservoir assembly without exerting continual stress therein. Reservoir assemblies can be utilized to contain products for a wide variety of purposes such as cosmetics, paint, glue, or medicine and those products can be in many different forms such as liquid, gel, or compressed powder. For most products an applicator affixes to the reservoir assembly in creating a compact product container. For such product containers, the applicator must have a sealed access into the reservoir assembly and must be detachably affixed thereto. The portal bushing is usually adapted to cooperate in providing both the sealed access and the detachable affixment, and one well-known portal bushing is disclosed in U.S. Pat. No. 3,549,266 which was issued to the present applicant.

As shown in the above mentioned patent, the applicator typically extends through the bushing to interface with the product stored in a reservoir body. A sealing means is provided on the bushing to preclude the product from leaking between it and either the reservoir body or the applicator. Threads are disposed on the bushing by which the applicator is detachably affixed to the reservoir assembly. Therefore, during utilization of the product container, torsional forces are translated through the bushing due to the mating threads, while thrust forces are translated through the bushing due to the pressure exerted against the applicator by the sealing means.

Reservoir assemblies of this type are retained against these thrust and torsional forces by an interference fit between the bushing and the reservoir body, and therefore, an continual stress is exerted therebetween. Variations in the type of product, the structure of the applicator and the size of the reservoir body cause the interference fit necessary for translating each of these forces to differ widely in magnitude for some product containers. Where a large spread exists between these forces, the interference fit must be sufficient to translate the larger force and, therefore, the continual stress is always proportional to the larger force. Depending on the materials utilized in these parts and their specific configuration, the continual stress developed may result in the occurrence of creep to cause distortion in the parts over a period of time. The interference fit deteriorates in proportion to this distortion and therefore, after creep occurs, the reservoir assembly is no longer useful because the forces encountered therein can no longer be translated between the bushing and reservoir body.

SUMMARY OF THE INVENTION

It is, therefore, a general object of the present invention to provide a portal bushing which is utilized in a reservoir assembly to minimize and obviate the disadvantages of the prior art.

It is a specific object of the present invention to provide a portal bushing which includes means for interlocking with a reservoir body to translate forces therebetween without exerting continual stress.

It is a more specific object of the present invention to provide a portal bushing having a lip which is en-

gageable with a groove on a reservoir body to translate thrust forces therebetween.

It is another object of the present invention to provide a portal bushing which includes means for penetrating a reservoir body to translate torsional forces therebetween.

These objects are accomplished in one form according to the present invention by arranging an annular lip and teeth on the bushing to cooperatively engage respectively with a groove and a penetrable portion on a reservoir body. Both the annular lip and the teeth are peripherally disposed about the longitudinal axis of the bushing and both require that forces be exerted between the bushing and the reservoir body when assembly occurs therebetween. After assembly, however, no continual internal force is necessary to retain the assembly and, therefore, no distortion from creep is encountered in either the bushing or the reservoir body. When the assembly is utilized as part of a product container, the thrust forces developing between the bushing and the reservoir body are translated through the annular lip while the torsional forces developing therebetween are translated through the teeth.

BRIEF DESCRIPTION OF THE DRAWING

The manner in which these and other objects of the invention are achieved will be best understood by reference to the following description, the appended claims, and the Figures of the attached drawing wherein:

FIG. 1 is an elevational view of an assembled product container including a reservoir assembly and an applicator with portions thereof cut away to illustrate the portal bushing of this invention;

FIG. 2 is an enlarged partial elevational view of the reservoir assembly with the applicator entering through the portal bushing and with portions thereof cut away to illustrate the operation of the interlocking means on the bushing;

FIG. 3 is an exploded view of the bushing and the sealing means illustrating one suitable construction for the bushing;

FIG. 4 is a partial sectional view of the reservoir assembly, taken substantially along line 4—4 of FIG. 2 to illustrate the engagement attained between the teeth on the bushing and the penetrable portion on the reservoir body;

FIG. 5 is an enlarged partial sectional view similar to that of FIG. 4 and illustrating the use of periodically grouped teeth on the bushing; and

FIG. 6 is an enlarged partial sectional view similar to FIG. 4 and illustrating the use of teeth on the penetrable portion of the reservoir body.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the drawing, and more particularly to FIG. 1, there is illustrated a product container 10 in which a reservoir assembly 12 and an applicator 14 are detachably joined. The applicator 14 is constructed of a cylindrical shell 16 within which is mounted a cup-shaped insert 18 providing female threads 20 and securing one end of a shaft 22. At the other end of the shaft 22, longitudinally arranged bristles form a tip 24 to which product adheres when the applicator 14 is joined to the reservoir assembly 12. Other types of applicator tips are known in that the bristles on some tips are radially arranged, while other tips have only spiral

grooves and still other tips are made of either felt or cellular foams in both the open and closed cell varieties. Although these other types of tips are not shown in this disclosure to be useable with the portal bushing of this invention, no reason exists to preclude such utilization.

Construction of the reservoir assembly 12 is illustrated in FIG. 2 where the shaft 22 of the applicator 14 is shown entering into the reservoir assembly 12 through a portal bushing 26. A reservoir body 28 affixes the bushing 26 and a sealing means 30 is affixed to the bushing 26 for preventing leakage of the product from the product container 10. For purposes of simplification only, a sealing gland 32 having the same configuration as that disclosed in my copending application Ser. No. 348,103 filed on even date herewith is utilized as the sealing means 30. As illustrated in FIG. 3, the sealing gland 32 is structured in the form of a tubular frame 34 on which a wiper means 36 for developing sealing forces against the applicator 14 and an annular lip 38 are integrally disposed. The wiper means 36 is disposed across the longitudinal axis of the tubular frame 34 at one axial end thereof, whereas the annular lip 38 is disposed on the interior wall of the tubular frame 34 at the other axial end thereof. The tubular frame 34 is conically shaped being of minimum diameter at the wiper means end and of maximum diameter at the annular lip end.

The bushing 26 is fabricated of any suitable material, such as metal, and as illustrated in Fig. 3, is configured at its forward end to secure the sealing means 30. Because of the particular configuration of the sealing gland 32 utilized as the sealing means 30, the bushing 26 is configured to have an annular shoulder 40 and an annular groove 42. A tapered lead 44 is disposed on the annular shoulder 40 to facilitate the interassembly of the sealing gland 32 to the bushing 26. On its other end, the bushing 26 has male threads 46 for engaging the female threads 20 on the applicator 14. A means for interlocking with the reservoir body 28 is disposed on the bushing 26 and includes a lip 48 and a means 50 for penetrating the reservoir body 28. A conical passage 52 extends through the bushing 26 and serves as an entrance for the applicator 14 into the reservoir assembly 12.

Although the reservoir body 28 may have any overall configuration, for purposes of simplification it is illustrated as being cylindrically shaped with a chamber 54 having an opening at one end and it can be fabricated of any suitable material, such as plastic. At its open end the reservoir body 28 is configured to receive and retain the bushing 26. This configuration includes a mouth 56, a groove 58, and a penetrable portion 60. The mouth 56 is sized to pass over the penetrating means 50 on the bushing 26 but to present an interference to the lip 48 thereon. The groove 58 is sized to receive the lip 48, while the penetrable portion 60 is sized to present an interference to the penetrating means 50.

Before the bushing 26 is assembled into the reservoir body 28 the sealing means 30 is affixed thereto. For the sealing gland 32 disclosed herein as the sealing means 30, this is accomplished by engaging the annular lip 38 thereof into the annular groove 42 on the bushing 26 and thereby an interlock is established therebetween. Then the bushing 26 is assembled into the reservoir body 28 by directing the sealing gland 32 into the mouth 56 thereof, after which the bushing 26 is force-

ably inserted therein until the mouth 56 interferes with the lip 48. Then with the longitudinal axes of the bushing 26 and the reservoir body 28 aligned, the inserting force is increased to enlarge the mouth 56 and pass the lip 48 into the groove 58 while simultaneously piercing the penetrable portion 60 with the penetrating means 50. A tapered lead 62 is provided on the lip 48 toward the forward end of the bushing 26 to facilitate insertion of the bushing 26 into the reservoir body 28. As the bushing 26 is interlocked with the reservoir body 28, the tubular frame 34 and annular lip 38 on the sealing gland 32 are compressed therebetween to create a peripheral seal (see FIG. 2) around the bushing 26.

The useful life of the reservoir assembly 12 is enhanced considerably by incorporation of the bushing 26 therein. This is so because after the bushing 26 has been inserted into the reservoir body 28, no continual stress is required thereafter to retain the reservoir assembly 12 against the thrust and torsional forces developed therein when it is utilized in the product container 10. Continual stress is avoided in the reservoir assembly 12 of this invention because no interference fit is essential to its construction. The bushing 26 and reservoir body 28 are retained in assembly by the interlocking means with thrust forces therebetween being translated through the engagement of the lip 48 with the groove 58 and torsional forces therebetween being translated through engagement of the penetrating means 50 into the penetrable portion 60. In conventional reservoir assemblies both the thrust and torsional forces are translated through an interference fit which exerts continual stress between the bushing and the reservoir body. As time passes, the continual stress causes creep to occur in the materials, which lessens the interference fit and results in failure of the reservoir assembly.

As illustrated in FIGS. 1-3, the opening into the reservoir assembly 12 is usually cylindrically shaped and, therefore, both the lip 48 on the bushing 26 and the groove 58 in the reservoir body 28 are annularly shaped. However, where a reduction is desirable in the force required to assemble the bushing 26 and the reservoir body 28, the lip 48 may consist of a plurality of arcuate portions periodically disposed. Also, the lip 48-groove 58 combination can be reversed where conducive to a particular application; that is, the lip can readily be disposed on the reservoir body and the groove can be readily disposed on the bushing.

The penetrating means 50 can also be of many different structural arrangements depending on the application. Generally, the penetrating means 50 is comprised of a serrated surface having biting edges, such as a knurl, or an arrangement of teeth. In FIGS. 1-3, the penetrating means 50 on the bushing 26 consists of peripherally disposed teeth 64 which pierce into the penetrable portion 60 on the reservoir body 28 to result in full peripheral engagement therebetween, as illustrated in FIG. 4. Therefore, the bit of the teeth 64 into the reservoir body 28 is parallel to the longitudinal axis of the bushing 26. In many applications, the torsional forces can be translated through less than a full peripheral engagement. Therefore, a reduction in the forces required to assemble the bushing 26' into the reservoir body 28' can be achieved by grouping the teeth 64' periodically on the bushing 26', as illustrated in FIG. 5 where similar parts are identified by the same reference numerals as used in FIGS. 1-4, but with a prime (')

added. Naturally, this same result can be accomplished with the bushing 26 shown in FIGS. 1-4 by disposing the penetrable portion periodically on the reservoir body. Furthermore, teeth 66 can be disposed about the periphery of the penetrable portion 60'' at a different pitch to those on the bushing 26'', as illustrated in FIG. 6 where similar parts are identified by the same reference numerals as used in FIGS. 1-4, but with a double prime (') added. The amount of material pierced by the teeth 64'' on the bushing 26'' is proportional to the relative difference in pitch of the teeth 64'' and 66 on the bushing 26'' and the reservoir body 28'' respectively. Of course, teeth could be disposed on the reservoir body of complementary size and pitch to the teeth on the bushing and thereby accomplish the interlocking means through meshing rather than piercing to result in very little if any assembly force.

The lip 48 and the penetrating means 50 have been disclosed above as being separate and distinct for illustrative purposes only. It should be realized, of course, that the penetrating means 50 could be disposed integrally on the lip 48, such as by distributing teeth over the tapered lead 62 thereof. In such an arrangement, the bite of the teeth into the reservoir body would project radially from the longitudinal axis of the bushing.

Those skilled in this art should readily appreciate that the bushing embodied by this invention may be utilized to provide an interlock with a reservoir body and thereby avoid the exertion of continual stress therebetween. Also, thrust forces are translated from the bushing by a lip which is engageable into a groove on the reservoir body, while torsional forces are translated from the bushing by penetrating means which is engageable with a penetrable portion on the reservoir body.

It should be understood that the present disclosure has been made only by way of example and that numerous changes in details of construction and the combination or arrangement of parts may be resorted to without departing from the spirit and the scope of the invention. Therefore, the present disclosure should be construed as illustrative rather than limiting.

What I claim is:

1. A portal bushing for use with a reservoir body in a reservoir assembly to provide access thereto for an applicator, said bushing comprising:

a generally cylindrical body with a passage there-through between a first axial end and a second axial end;

means for affixing a seal around the external periphery of said cylindrical body, said affixing means being disposed on said first axial end; and

a lip for interlocking with the reservoir body and means for penetrating into the reservoir body, said lip and said penetrating means being disposed on the external periphery of said cylindrical body between said first axial end and said second axial end, said lip being engageable with a groove in the reservoir body to translate thrust forces therebetween and said penetrating means being engageable into a penetrable portion on the reservoir body to translate torsional forces therebetween, said lip and said penetrating means being effective to retain said cylindrical body in the reservoir body with no continual stress being exerted therebetween.

2. The portal bushing of claim 1 wherein said lip is annularly disposed about said bushing.

3. The bushing of claim 1 wherein said penetrating means includes teeth, said teeth being arranged to pierce the penetrable portion on the reservoir body upon assembly of said bushing therewith.

4. The bushing of claim 3 wherein said teeth are disposed about the full periphery of said bushing, said teeth presenting a bite parallel to the longitudinal axis of said bushing.

5. The bushing of claim 3 wherein said teeth are disposed in groups periodically about the periphery of said bushing, said teeth presenting a bite parallel to the longitudinal axis of said bushing.

6. The bushing of claim 1 wherein said lip is annularly disposed about said bushing and said penetrating means includes teeth, said teeth being arranged to pierce the penetrable portion on the reservoir body upon assembly of said bushing therewith.

7. The bushing of claim 6 wherein said teeth are disposed about the full periphery of said bushing, said teeth presenting a bite parallel to the longitudinal axis of said bushing.

8. The bushing of claim 6 wherein said teeth are disposed in groups periodically about the periphery of said bushing, said teeth presenting a bite parallel to the longitudinal axis of said bushing.

9. A portal bushing for use with a reservoir body in a reservoir assembly to provide access thereto for an applicator, said bushing comprising:

a generally cylindrical body with a passage there-through between a first axial end and a second axial end;

means for affixing a seal around the external periphery of said cylindrical body, said affixing means being disposed on said first axial end;

means for interconnecting the reservoir assembly to the applicator, said interconnecting means being disposed on said second axial end; and

a lip for interlocking with the reservoir body and means for penetrating into the reservoir body, said lip and said penetrating means being disposed on the external periphery of said cylindrical body between said first axial end and said second axial end, said lip being engageable with a groove in the reservoir body to translate thrust forces therebetween and said penetrating means being engageable into a penetrable portion on the reservoir body to translate torsional forces therebetween, said lip and said penetrating means being effective to retain said cylindrical body in the reservoir body with no continual stress being exerted therebetween.

10. A portal bushing for use with a reservoir body in a reservoir assembly to provide access thereto for an applicator, said bushing comprising:

a generally cylindrical body with a passage there-through between a first axial end and a second axial end;

means for affixing a seal around the external periphery of said cylindrical body, said affixing means being disposed on said first axial end;

thread means for interconnecting the reservoir assembly to the applicator, said thread means being disposed on said second axial end; and

a lip for interlocking with the reservoir body and means for penetrating into the reservoir body, said lip and said penetrating means being disposed on

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the external periphery of said cylindrical body between said first axial end and said second axial end, said lip being engageable with a groove in the reservoir body to translate thrust forces therebetween and said penetrating means being engageable into a penetrable portion on the reservoir body to trans-

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late torsional forces therebetween, said lip and said penetrating means being effective to retain said cylindrical body in the reservoir body with no continual stress being exerted therebetween.

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