Feb. 9, 1960 C. J. GENTILE 2,923,957

BALL APPLICATOR DISPENSERS

Filed Nov. 13, 1957 2 Sheets-Sheet 1

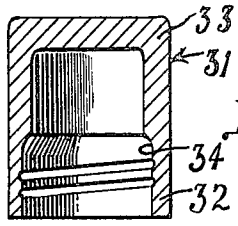

Fig. 2.

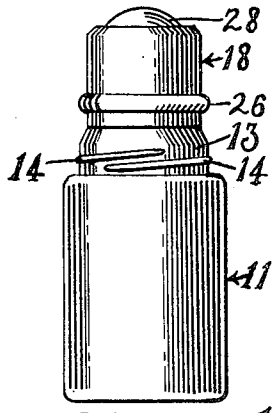

Fig. 1.

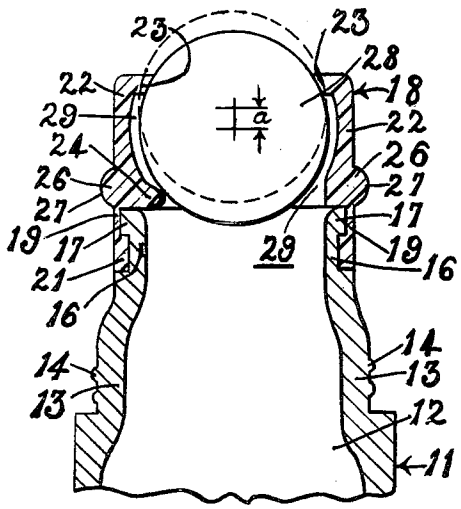

Fig. 3.

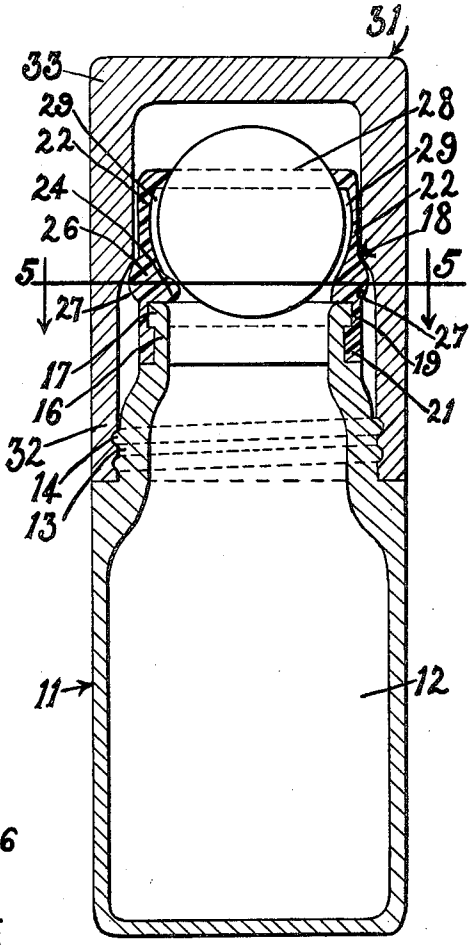

Fig. 4.

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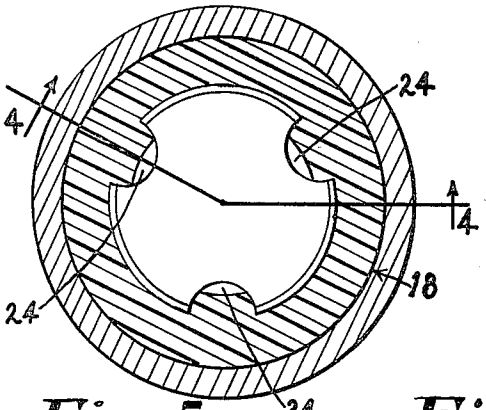

Fig. 5.

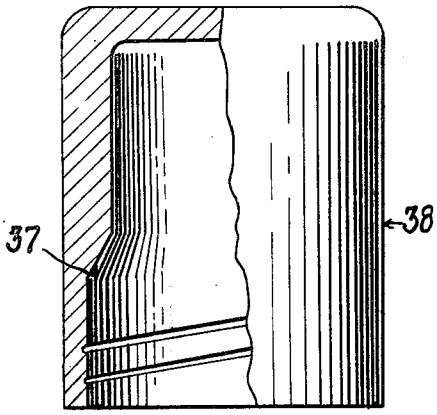

Fig. 7.

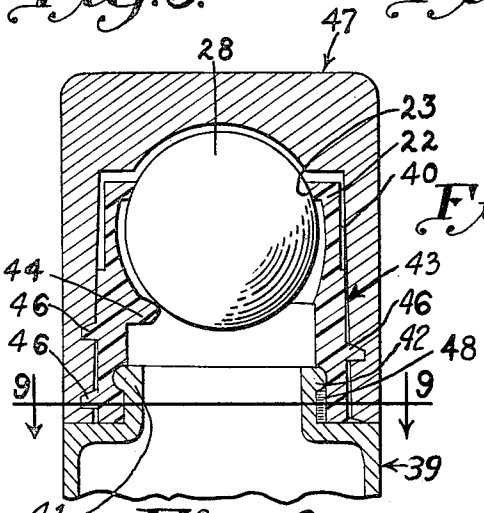

Fig. 8.

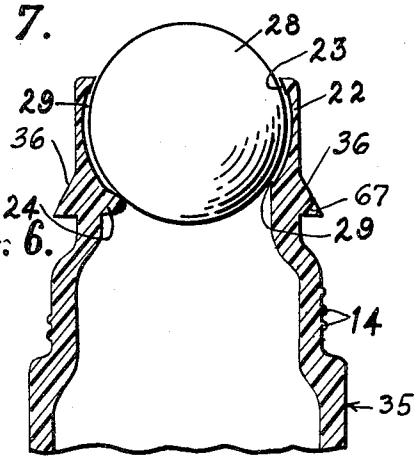

Fig. 6.

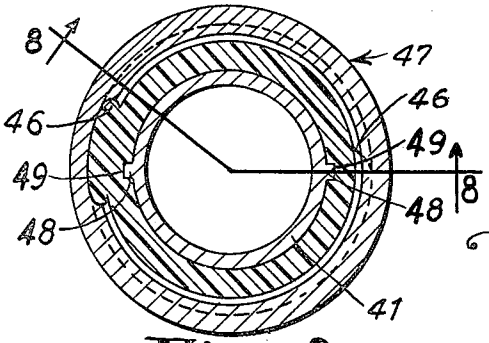

Fig. 9.

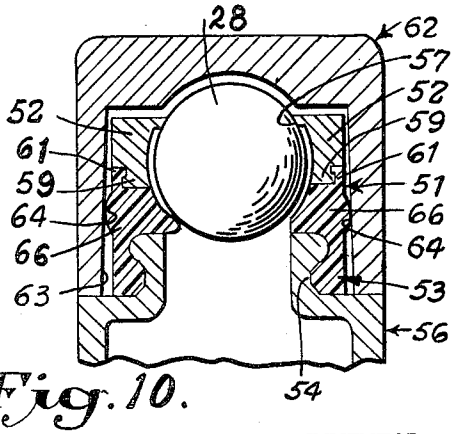

Fig. 10.

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BALL APPLICATOR DISPENSERS

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Application November 13, 1957, Serial No. 696,213

8 Claims. (Cl. 15—132.7)

This invention pertains to dispensers and more particularly to those of the type having a reservoir for fluid, cream or pasty contents and a rotatable ball for transferring the contents from the reservoir.

Dispensers of the rotatable ball type are particularly desirable for dispensing fluid contents in relatively small, easily controllable amounts, as in the form of thin lines or films. Thus, inks, medicated lotions or tinctures and cosmetics such as perfumes, deodorants and the like are admirably suited for dispensing from this type of device which generally consists of a reservoir having an open end and a spherical ball rotatably mounted partially within the open end with an outer minor portion of the ball projecting beyond the open end for rotatable contact with a surface to which the contents of the reservoir is to be applied.

The almost universal practice of the prior art has been to seal the reservoir by applying a cap or other means to the open end and about the ball whereby a vertical force is applied to the ball to seal an inner minor portion of the same against a toric sealing surface provided within the reservoir and supporting the ball. Many obvious disadvantages accrue by reason of such a construction. Thus, when the dispenser is inverted for use and the ball pressed against the surface to which the fluid contents is to be applied, the pressure against the ball forces the same against the toric seat thereby interfering with the smooth rotation of the ball and cutting off further flow of liquid from the reservoir to the ball. It is common practice to provide the sealing cap with a shoe depending from the inner surface of the closed end thereof and engageable with an outer portion of the ball to force the same vertically inwardly of the open end of the container and against the toric seat. When the dispenser is thus closed and the ball sealed against the toric seat, a major portion of the surface of the ball is isolated from the reservoir and the moist air contained therein and is exposed to the relatively dry air entrapped between the ball and the cap. This most frequently results in a relatively rapid drying of the thin film of liquid remaining on this portion of the ball; such drying of the product leaves a solid residue which causes the ball to stick thus interfering with proper rotation of the ball, or to "freeze," thus preventing rotation altogether.

Although these several disadvantages inherent in prior art rotatable ball dispensers were, in a large part, overcome by R. H. Thomas, U.S. Patent No. 2,749,566, wherein is provided a resilient collar surrounding the ball and having an outer bearing portion adapted to be resiliently deformed by contact with a properly shaped cap into sealing engagement with an outer minor portion of the ball, even the dispensers of the Thomas patent are susceptible of improvement.

Therefore, it is an object of the present invention to provide a non-sticking, non-freezing rotatable ball dispenser.

It is another object of the invention to provide a rotatable ball dispenser possessing an improved means of

sealing against leakage and evaporation of the contents thereof.

Other objects and advantages of the invention will appear from the following description.

In accordance with the above objects, a preferred form of the invention provides a container having an open end, a spherical ball, means to rotatably support the ball adjacent the open end of the container, the means comprising an annular member or ring having, at one extremity thereof, a clamping portion for attaching the ring to the open end of the container, and a toric sealing surface about the other extremity, outwardly of the open end, for engaging an outer minor portion of the ball to retain the ball against excessive movement outwardly of the open end of the container and to seal the interior of the container. Between the extremities thereof, the ring is provided with a resilient bearing portion comprising, on the interior of the ring, a plurality of radially inwardly projecting ball-supporting cammable surfaces or lugs for rotatably supporting the ball within the ring and, on the exterior of the ring, with a rib extending circumferentially of the ring and opposite the inwardly projecting bearing lugs. A cap, relatively rigid as compared to the resilient bearing portion, is provided, on its interior surface, with a circumferential camming surface engageable with the rib of the ring whereby, when the cap is secured to the container in a closed position, the rib is forced radially inwardly by the camming surface, thereby compressing the resilient bearing portion of the ring and camming the ball-supporting lugs radially inwardly. This causes the ball to be thrust outwardly of the open end of the container into sealing engagement with the toric sealing surface.

The invention will now be described in greater detail with reference to the appended drawings wherein:

Fig. 1 is a side elevational view of one embodiment of the invention showing the container with the ball and the ring mounted thereon;

Fig. 2 is a cross-sectional side elevation of a cap adapted to be used with the dispenser illustrated in Fig. 1;

Fig. 3 is an enlarged cross-sectional side elevation of the dispensing end of the device illustrated in Fig. 1; the ball being shown in full view;

Fig. 4 is an enlarged cross-sectional side elevation of the dispenser of Fig. 1, and the cap of Fig. 2, the latter being shown attached to the container in a closed position, the view of Fig. 4 being taken along the line 4—4 of Fig. 5;

Fig. 5 is a cross-sectional view taken along line 5—5 of Fig. 4, the ball being omitted for the sake of clarity;

Fig. 6 is a cross-sectional side elevation of the dispensing end of a modified construction of the dispenser;

Fig. 7 is a side elevational view, partially in cross-section, of a cap suitable for use with the dispenser illustrated in Fig. 6;

Fig. 8 is a cross-sectional side elevation of the dispensing end of another modification of the invention and having the cap attached to the dispenser, the view of Fig. 8 being taken along the line 8—8 of Fig. 9;

Fig. 9 is a cross-sectional view taken along line 9—9 of Fig. 8; and

Fig. 10 is a cross-sectional side elevation of a further modification of the invention and having the cap shown attached to the dispenser.

Referring now to the drawings, wherein the same reference numerals are used to designate similar parts, and more particularly to Figs. 1–5, one embodiment of a dispenser constructed in accordance with the invention comprises a container designated generally by the numeral 11 including a reservoir 12, a portion 13 of reduced diameter provided with external threads 14 and a neck portion 16 having a still smaller diameter. The neck

portion 16 is provided with a peripheral flange 17 extending circumferentially about an open end of the neck. The container 11 may be constructed of any suitable material such as glass, metal, synthetic plastic or the like.

An annular member or ring designated generally by the numeral 18 is provided for attachment to the neck portion 16 of the container. The ring is formed of a resiliently deformable material such as natural or synthetic rubber, synthetic plastic or the like and is provided at an inner extremity thereof with a clamping portion consisting of a depending skirt 19 having a lip 21 directed inwardly of the ring and extending circumferentially about the inward extremity thereof. The ring is further provided with a side wall 22 terminating, at an outer extremity of the ring, in a sealing surface or lip 23 (Fig. 3) directed inwardly of the ring and extending circumferentially about the outer extremity thereof. Intermediate the extremities of the ring and between the depending skirt 19 and the side wall 22 is a bearing portion consisting of a plurality of cammable ball-supporting lugs 24 directed radially inwardly from the inner surface of the ring and a cammable member or rib 26 extending circumferentially about the exterior of the ring opposite the lugs and forming a bearing surface 27 which, as illustrated in Figs. 1 and 3, may usefully take the form of an arcuate surface, for example, one which, in vertical cross-section of the rib, presents a semi-circular periphery.

Mounted within the ring 18 and rotatably supported by the lugs 24 about an inner minor portion is a spherical ball 28. An outer minor portion of the ball 28 projects beyond the open outer end of the ring and, in the upright position or while in use in the inverted dispensing position of the dispenser, is spaced a slight distance from the sealing surface 23 (Fig. 3) in order to permit rotation of the ball and the transport thereby of a surface film of fluid or semi-fluid contents from the reservoir to the exterior of the dispenser for application to a surface. The normal spacing between the ball 28 and the sealing surface 23 may vary, depending upon the physical characteristics of the fluid to be dispensed. It would, of course, be relatively less for a mobile liquid such as a perfume having an alcoholic base than it would be in the case of a viscous material such as a deodorant lotion or the like. The ball 28 is also preferably spaced from the side wall 22 of the ring thereby forming a secondary reservoir 29.

The ring 18 is secured to the neck portion 16 of the container 11 by forcing the lip 21 of the depending skirt 19 over the flange 17 of the neck whereby the lip 21 underlies the overhanging flange 17 to hold the ring 18 securely in place with the extremity of the neck abutting the bearing portion of the ring.

A cap, generally designated by the numeral 31 (Fig. 2) is provide with a lower part 32 of expanded internal diameter and an upper part 33 of reduced internal diameter. The lower part 32 is internally threaded for engagement with the threads 14 of the portion 13 of the container 11 whereby the cap may be secured to the container. The internal surface of the lower and upper parts 32 and 33 of the cap are connected by a circumferentially extending camming surface 34 which, as illustrated, may be of an arcuate shape having a radius of curvature greater than that of the bearing surface 27.

In operation, the uncapped dispenser, containing a fluid to be dispensed from the reservoir 12, is inverted and the ball 28 pressed against the surface on which the fluid content is to be applied. As the ball is moved across the surface, it rotates within the ring 18 thereby continually transporting a surface film of fluid from the reservoir of the container to the surface. When the dispenser is returned to the upright position, the secondary reservoir 29 remains filled wtih fluid due to capillary attraction. This fluid thereby becomes immediately available to be dispensed even from an upright position of the dispenser.

To seal the dispenser, the cap 31 is placed over the dispensing end of the dispenser and secured to the container by means of the threads 14. As the cap 31 is tightened, the camming surface 34 on the interior of the cap comes into contact with the bearing surface 27 of the rib 26 and as the cap is progressively tightened, the rib 26 is compressed thereby deforming the resilient bearing portion and camming the lugs 24 radially inwardly against the ball 28. The normal spacing between the ball 28 and the sealing surface 23 permits a limited extent of movement of the ball 28 axially of the container and the ring. This extent of axial travel of the ball 28, denoted by the letter "*a*" (Fig. 3) consists of the distance which the ball can move from its innermost or rest position, indicated in solid line in Fig. 3, to its outermost position in engagement about an outer minor portion thereof with the sealing surface 23. This outermost position of the ball is illustrated in Fig. 4 and in dashed line in Fig. 3. Therefore, when the lugs 24 are forced inwardly against the ball 28, the latter is forced to move axially outwardly of the container and into sealing engagement with the sealing surface 23.

A seal about an outer minor portion of the ball is especially desirable inasmuch as this leaves a major portion of the surface of the ball exposed to the humid air within the fluid reservoir 12, thereby preventing the evaporation of any fluid remaining on this portion of the ball and decreasing the chances of the ball sticking or freezing during operation. The formation of this seal about an outer minor portion of the ball in accordance with the construction of the invention is particularly useful inasmuch as it results in a positive sealing action between the ball 28 and the sealing surface 23, whereby the greater the force which is applied through the bearing surface 27 and the cammable lugs 24 against the ball 28, the tighter the ball is squeezed against the sealing surface 23 since the effect is to force a larger diameter portion of the ball against the sealing surface. As illustrated in Fig. 4, the upper porton 33 of the cap may, in a closed position of the cap, be slightly spaced from the wall 22 of the ring 18. Where the entire ring 18 is of resilient material, this permits the wall 22 and associated sealing surface 23 to be cammed radially outwardly by the ball 28. The reactive force exerted by the sealing surface 23 on the ball due to the tensioned wall 22 aids in the effective sealing of the container. Alternatively, the upper portion 33 of the cap 31 may be so dimensioned that, in a closed position of the cap, it abuts the wall 22 whereby the latter is supported in substantially its original position when the ball is thrust into contact with the sealing surface 23.

Another embodiment of the dispenser constructed in accordance with the invention is illustrated in Figs. 6 and 7. As illustrated therein, a single, integral structure of resilient material, designated generally by the numeral 35, may take the place of the separate rigid container and resilient ring of the embodiment of Figs. 1–5. The construction and operation of the embodiment of Figs. 6 and 7 is essentially the same as that of the previous embodiment. The provision of an integral resilient container and ball supporting means is particularly advantageous in that the radially inward deformation of the bearing portion is more easily accomplished in the case where not only the bearing portion but the adjacent structures as well are constructed of a resilient material. The cammable member may take shapes other than the arcuate shape illustrated in Figs. 1–5. For example, as illustrated in Fig. 6, the cammable member 67 may have a generally triangular vertical cross-section defining an inclined, planar bearing surface 36 for engagement with a correspondingly shaped planar camming surface 37 on a cap 38. The surface 37 is preferably at a greater angle to the horizontal than is surface 36 in order that surface 37 can, upon application of

the cap 38, exert a radially inward squeezing action on the surface 27.

Still another embodiment of the dispenser constructed in accordance with the invention is illustrated in Figs. 8 and 9 wherein a rigid container denoted generally by the numeral 39, is provided with a reduced diameter neck portion 41 having a flange 42 extending about an open end thereof. A resilient ring, denoted generally by the numeral 43, is provided for attachment to the neck portion of the container about the flange 42. Lugs 44 are provided on the ring for rotatably supporting the ball 28 and the exterior of the ring opposite and inwardly of the lugs is provided with threads 46. The interior surface of a cap 47 is grooved for reception of the threads 46, and is tapered radially inwardly from the open end of the cap so that the root diameter of the internal threads at the open end of the cap is greater than that of the threads spaced further from the open end of the cap.

The operation of the embodiment of Fig. 8 is essentially similar to that of the foregoing embodiments. To seal the dispenser, the cap 47 is engaged with the threads 46 and tightened whereby the bearing portion of the ring 43 is compressed and deformed to cam the lugs 44 radially inwardly against the ball 28 whereby the latter is moved axially outwardly of the container into sealing engagement with the sealing surface. As illustrated in Fig. 8, the bearing portion of the ring 43 is preferably of a larger diameter than the side wall 22 whereby the cap 47 contacts only the bearing portion and whereby the intervening space 40 between the side wall 22 and the cap 47 permits the side wall to be forced radially outwardly by contact of the ball 28 with the sealing surface 23. This added tension on the resilient side wall aids in maintaining a fluid-tight seal between the ball and the sealing surface. As illustrated in Figs. 8 and 9, the neck portion 41 of the container 39 may be provided with one or more keys 48 for engagement with correspondingly shaped slots 49 in the ring 43. Such construction assures against rotation of the ring 43 about the neck 41 of the container when the cap 47 is tightened about the ring.

Yet another embodiment of a dispenser constructed in accordance with the invention is illustrated in Fig. 10 wherein a ring, denoted generally by the numeral 51 and consisting of rigid bearing portion 52 and resilient clamping portion denoted generally by the numeral 53, is secured by the clamping portion thereof to a flanged neck 54 of a container 56. As illustrated, a sealing surface 57 may be formed on bearing portion 52 which is constructed of rigid material and provided with a beaded rim 59 for frictional engagement with a correspondingly shaped skirt 61 projecting from the outer extremity of the clamping member. In this manner, the bearing portion 52 may be mounted on the clamping portion 53 to enclose the ball 28. The bearing portion 52 may be constructed of any suitable material such as glass, metal, hard plastic or the like.

As illustrated in Fig. 10, a camming surface on the interior of a hollow cap 62 may consist simply of a truncated conical surface 63 frictionally engageable with a bearing surface 64 of a cammable rib 66 to effect a sealing engagement between the ball 28 and sealing surface 57 in essentially the same manner as in the embodiments previously described.

It is to be understood that various additions or modifications within the ordinary ability of one skilled in the art may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. A fluid dispenser comprising a container having an open end, a ring attached at an inner extremity thereof to said container about said open end and having a radially inwardly directed toric sealing surface extending about an outer extremity, a spherical ball within said ring and extending partially beyond said sealing surface, said ring being provided with a resiliently deformable bearing portion including a plurality of radially inwardly directed lugs rotatably supporting said ball about an inner minor portion thereof, a hollow cap attachable to said container about said ring, and means within said cap engageable with said bearing portion to force said lugs radially inwardly whereby said ball is moved axially outwardly of said open end into sealing engagement about an outer minor portion thereof with said toric sealing surface.

2. A dispenser comprising a container having an open end, a resiliently deformable ring secured at an inner extremity thereof to said container about said open end, a spherical ball, said ring being provided, at an outer extremity thereof, with a circumferentially extending sealing surface defining an aperture having a diameter smaller than that of said ball, said ball being mounted within said ring and extending partially through said aperture, said ring being provided with a plurality of radially inwardly directed lugs rotatably supporting said ball about an inner minor portion thereof, said ball being capable of limited movement outwardly of said open end, said ring being provided with a bearing portion having an exterior bearing surface extending circumferentially thereof opposite said inner minor portion of said ball, and a hollow cap relatively rigid compared to said ring and provided with an internal camming surface engageable with said bearing surface of said bearing portion whereby said bearing portion is deformed and the lugs displaced radially inwardly thereby moving said ball outwardly of said open end into sealing engagement about an outer minor portion thereof with said circumferentially extending sealing surface.

3. A dispenser comprising a container including a reservoir for fluid contents and a resiliently deformable annular neck having an open end and an external bearing surface thereabout, a radially inwardly directed sealing surface about said open end, a spherical ball partially within said neck, means within said neck and opposite said external bearing surface to rotatably support said ball with an outer minor portion thereof projecting beyond said open end and spaced from said sealing surface in a dispensing position of the ball, and a hollow cap relatively rigid compared to said neck and having an interior camming means engageable with said bearing portion whereby the same is resiliently deformed thereby camming the ball-supporting means radially inwardly against an inner minor portion of the ball to move the ball outwardly of said open end into fluid-tight sealing engagement with said sealing surface.

4. A dispenser comprising a container having an open end, a resiliently deformable annular ring secured at an inner extremity thereof to said container about said open end, a plurality of lugs spaced from said inner extremity and projecting radially inwardly from an inner surface of said ring, a radially inwardly directed sealing surface extending about an outer extremity of said ring, a bearing surface projecting radially outwardly of an exterior surface of said ring substantially opposite said lugs, a spherical ball rotatably mounted about an inner minor portion thereof within said ring upon said lugs and extending partially beyond said sealing surface, and a cap relatively rigid compared to said ring and having, on an interior surface thereof, a circumferentially extending camming surface engageable with said bearing surface of said ring whereby when said cap is engaged with said ring, said lugs are cammed radially inwardly, thereby causing said ball to move outwardly of said open end into sealing engagement about an outer minor portion thereof with said sealing surface.

5. A dispenser comprising a container having an open end, a spherical ball, means to rotatably support said ball adjacent said open end, said means comprising an annular ring provided, at an inner extremity thereof, with a clamping portion whereby said ring may be attached to said container about said open end thereof, said ring being further provided, at an outer extremity thereof, with a sealing surface normally spaced from said ball and adapted to engage

an outer minor portion of said ball and retain said ball against more than a predetermined amount of movement outwardly of said open end, said ring being further provided, intermediate the extremities thereof, with a resilient bearing portion comprising radially inwardly projecting cammable surfaces rotatably supporting said ball about an inner minor portion thereof and an exterior bearing surface extending circumferentially of said bearing portion substantially opposite said cammable surfaces, and a hollow cap relatively rigid compared to said bearing portion, said cap being provided, on an interior surface thereof, with a circumferentially extending camming surface which, when said cap is engaged with said bearing surface, urges said bearing portion radially inwardly, whereby said cammable surfaces cause said ball to move outwardly of said open end into sealing engagement with said sealing surface of said ring.

6. As an article of manufacture a fluid deodorant containing and dispensing device, comprising a container having an open end, a supply of fluid deodorant within said container, an annular ring having a clamping portion firmly engaging said container about said open end, a spherical ball within said ring and having a portion thereof in contact with the fluid deodorant in said container, means for rotatably supporting said ball within said ring, said means comprising a plurality of spaced-apart cammable surfaces disposed within said ring and rotatably supporting said ball, said ring being provided adjacent an outer extremity thereof with a toric sealing surface encompassing an outer minor portion of said ball and retaining the same partially within said ring with a portion of said ball extending beyond said sealing surface and a resilient bearing portion encompassing an inner minor portion of said ball and connected to said cammable surfaces, and means for sealing said container comprising a cap for attachment to said container, said cap being provided with a camming surface engageable with said resilient bearing portion to effect a radially inward deformation thereof to impart a camming action to said cammable surfaces whereby said ball is moved axially outwardly of said open end into sealing engagement about an outer minor portion thereof with said sealing surface.

7. A fluid dispenser comprising a container having an open end, a spherical ball, a ring attached to said container about said open end and partially about said ball, said ring being provided adjacent one extremity thereof with a toric sealing surface encompassing an outer minor portion of said ball and defining an annular fluid discharge space between said ball and said ring, said ring being further provided with a resilient bearing portion encompassing an inner minor portion of said ball, said bearing portion including means to rotatably support said ball partially within said ring with a portion of said ball extending beyond said sealing surface, and camming means attachable to said container and engageable with said bearing portion to resiliently deform the same radially inwardly against said inner minor portion of said ball whereby said ball is urged axially outwardly of said open end into sealing engagement with said sealing surface.

8. A fluid dispenser and applicator comprising a container having an opening therein, a ring attached at one end to said container about said opening, the passage through said ring being restricted at the other end by an annular sealing lip, a freely rotatable ball disposed in said ring passage and having an outer minor portion extending through the opening defined by said annular lip, the ball and lip being normally spaced to define an annular fluid discharge passage, said ring being further provided with a resilient bearing portion encompassing an inner minor portion of said ball, said bearing portion including radially inwardly extending lugs supporting said ball, and means engageable with said bearing portion to resiliently force said lugs against the inner minor portion of said ball, whereby said ball is forced axially outwardly with respect to said ring into sealing engagement with said annular lip.

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