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J. C. WITTWER

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BOTTLE CAP WITH INTERLOCKING THREADS

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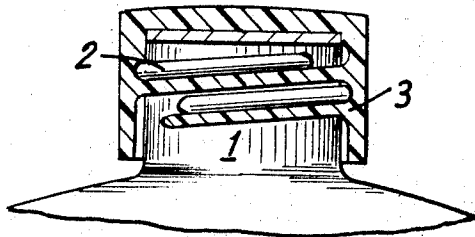


FIG. 1

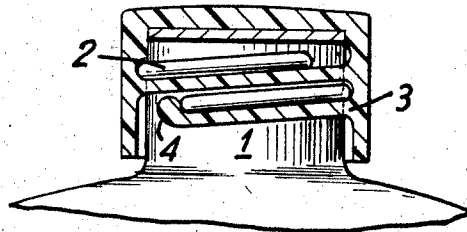


FIG. 2

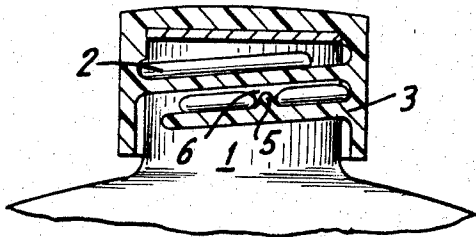


FIG. 3

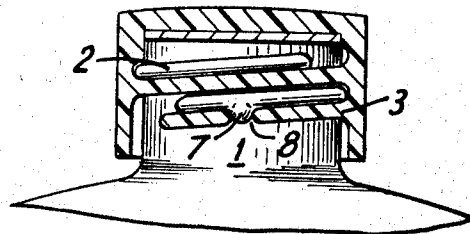


FIG. 4

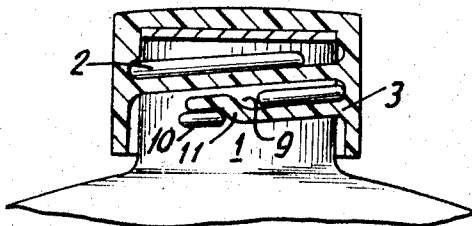


FIG. 5

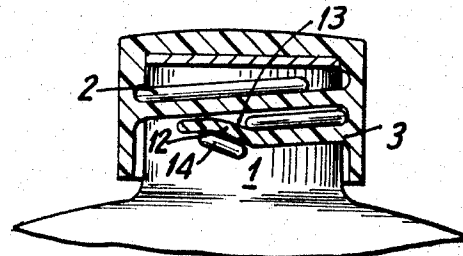


FIG. 6

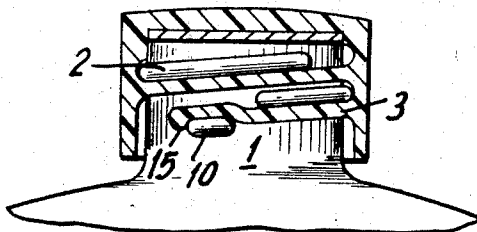


FIG. 7

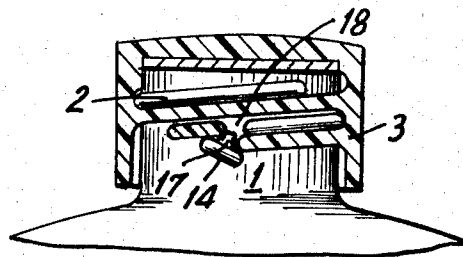


FIG. 8

INVENTOR
JOHN C. WITTWER

BY
Hopgood & Calimafde
ATTORNEYS

1

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BOTTLE CAP WITH INTERLOCKING THREADS

John C. Wittwer, R.F.D. 2, Mount Kisco, N.Y. 10549

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8 Claims

ABSTRACT OF THE DISCLOSURE

A threaded container cap with locking means incorporated as part of the threads. One of the threads is provided with a small protrusion or lug which falls into a detent provided in the other thread. Or, the lower extremity of one thread is modified to pass through an opening in the other where it is locked by jamming action.

This invention relates to the structure of threads on bottles and their accompanying caps, in order to incorporate locking means therein.

The problems of tightly fastening a bottle cap to render removal sufficiently difficult for children, or to retain the tightness of the cap during shipment or subsequent handling, have not been met in a simple, easily manufactured construction.

In the past, bottles have been provided with lugs protruding in the area below the threads which are engaged by structure extending from the cap. Some employ a lug and pawl structure exclusive of the thread and still others employ spring-actuated fasteners operative upon the cap when it reaches the desired closed position.

The object of the instant invention is to incorporate a positive lock in a basic thread structure.

A further object of the invention is to provide said positive lock through a simple modification of the thread structure which can be easily accomplished under existing methods of manufacture.

A further object of the invention is to enable the incorporation of said locking features at a minimum cost by accomplishing its objective without the addition of substantial structure in excess of that which comprises the ordinary thread.

The above objects are achieved by the instant invention in three ways: (1) adjusting the pitch of the cap thread in the area of its lower extremity to cross over its complementary thread, by (2) incorporating locking lugs or spurs within the thread structure, and (3) by a combination of the two. There exists between the mating threads, prior to the time when the junction becomes tight, a substantial amount of axial play made possible by space between said threads. The instant invention utilizes this space to carry the locking mechanism through said threads during the initial threading procedure. It is not until the end of the female thread stops the male thread that the junction becomes tight, and it is precisely at this point or just prior thereto that the locking mechanisms herein contemplated take effect. As a result, the lock is achieved without distorting or sacrificing the holding power of the threads themselves. This effect is most pronounced in the lug configuration, as once the lugs have fallen into their detents, they exert little or no axial force upon the junction but act only in opposition to rotary motion tending to loosen the cap. The cross-over provisions act in conjunction with the normal threads; and being situated at the far end of the male threads do not interfere with the joining surfaces themselves.

Bottles and bottle caps incorporating the invention can be formed by conventional well-known techniques, however, in some respects certain methods are preferable. For example, if a glass bottle is employed, an open mold is used. In this case, it is quite easy to add or cut-out a

2

mold element so that the projections or recesses may be easily formed. Phenolic bottle caps may be made from an unscrewable-type of mold, meaning that the phenolic caps themselves were unscrewed. This type of mold technique easily lends itself to the formation of cuts and recesses on the mold itself to provide the opposite, i.e., a projection on the cap. The flexibility of the phenolic will accommodate the distortion encountered at the projection during the unscrewing operation.

Polyethylene caps are conventionally pulled out of a mold even when threads are formed since polyethylene has sufficient flexibility. When projections or recesses are formed on the cap as produced by a complementary element located on the mold, the cap can still be easily pulled off because of this elastic characteristic. Therefore, lugs or cuts or recesses can be easily formed in any of the elements of the bottle or the cap.

A cap and bottle combination is thereby provided which locks the cap in place as the cap is screwed into the fully closed position. The precise dimensions of the suggested configurations will depend upon the deformable character of the material from which the cap is made and/or the material of the bottle.

In summary, the invention comprises a threaded joining means including male and female elements complementarily threaded, at least one such thread being of resilient material capable of elastic deformation during the joining process, in which one thread is interrupted by a dent, space, or kerf, into or through which passes a binding element or shoulder of the other thread; such that as the assembly is tightened together, the threads, as modified, will securely lock together.

The invention is more fully described and can best be understood by reference to the following figures which describe several embodiments thereof, wherein:

FIG. 1 illustrates an ordinary spiral threaded bottle and cap wherein the bottle provides the male thread and the cap the female thread, each complementary to the other.

FIGS. 2, 3 and 4 illustrate the utilization of locking lugs cooperating with dimples and kerfs in the complementary thread.

FIGS. 5 and 6 illustrate the embodiment of the invention wherein the bottle and cap threads are caused to cross in their lower extremity by the camming action of a detached portion of one of the threads, causing the threads to lock together.

FIGS. 7 and 8 illustrate the utilization of the cross-over cam and locking lug combination.

FIG. 1 illustrates a bottle neck 1 with a spiral thread 2 thereon. Attached thereto is a bottle cap with integral threads 3. This is a typical configuration in the prior art. It should be noted that the space between successive threads on the bottle is greater than the width of the cap threads passing therebetween. Up to the point where the top of cap 3 abuts against the top of bottle 1, the mating threads ride loosely between one another, with axial play permitted by the extra space between the threads. It is not until the top of cap 3 meets bottle 1 that the threads begin to bind and the tightening process begins. The invention utilizes this play and extra space to carry the described locking features into position, and places them such that their locking action is complementary with and actuated by the rotary tightening of the cap.

FIG. 2 is a thread configuration of FIG. 1 to which a small lug 4 has been added at the exterior end of the cap thread 3. The lug 4 is small enough to pass between the bottle threads 2 but rides across the end thereof locking the cap in place when the cap is tightened onto the bottle.

3

FIG. 3 is the side view of a spiral thread neck of the bottle 1 with the cap 3 screwed thereto, wherein a small lug 5 protrudes from the thread of the cap 3 and falls into a detent 6 provided in the thread of the bottle near its lower extremity.

This configuration provides for the locking of the cap 3 by the lug 5 falling into the detent 6 provided as the cap is tightened to its secure position. The advance of the bottle thread is such as to permit the passage of lug 5 between the threads 2 up to the point where abutment of the top of the cap 3 against the top of the bottle 1 acts to bring the threads together and thus tighten the cap. This tightening occurs just prior to the lug 5 entering the area of its detent 6 such that the amount of deformity required of the cap in order to advance the lug into position is in keeping with the elastic qualities of the material from which the cap is made. With the cap 3 in the closed position and the lug 5 seated, removal of the cap is opposed by the lug 5 acting on the sides of the detent 6. The resistance to opening will exceed the force required to seat the lug 5, as during the closing operation the lug 5 is guided into place by the cam action of the bottle thread 2 where as in the removal operation no such assistance is offered. For this reason, depending upon the materials utilized, it may be desirable to manufacture the cap so that the lug will fracture upon its first removal.

It can be further observed that this configuration offers positive indication that the cap has reached a desired position in the closing operation. This configuration gives added protection in the case of machine-applied caps in that the force required for removal exceeds that required for the initial setting of the cap.

FIG. 4 illustrates an embodiment of the invention as described in connection with FIG. 3 differing only in that a lug 7 is made part of the bottle thread 3 and the detent 8 a part of the cap thread 3. The operation of the invention in this configuration is substantially the same as described in FIG. 3. The selection of either embodiment being optional depending upon the materials utilized and simplicity of construction.

FIG. 5 illustrates a spiral threaded bottle neck 1 and 2, and cap 3 thereon, wherein the threads have been adapted for cross over. It can be seen that a small portion of the bottle thread 2 has been removed 9, and the remaining extremity 10 displaced axially to accommodate the cross over. The pitch of the lower extremity of the cap thread 11 has been reversed to the extent necessary to assure its interception of element 10 with resulting cross over. This configuration results in additional locking friction being created by wedging action as the cap is screwed to its final position. It can readily be seen that the modified portion of the cap thread 11 will ride through said opening and bind against element 10 of the bottle thread. The binding force created by this configuration will depend upon the force applied in application, but will add considerably to the frictional binding force created in ordinary closure. The advantage of this configuration is that the amount of such force will vary with the rotary force utilized in applying the top, and its effect can be retained through subsequent closings.

FIG. 6 is a modification of the invention as it appears in FIG. 5. The pitch of the lower extremity of the cap thread 3 has again been reversed 12. However, in this case, instead of removing a section of the bottle thread, it is simply broken 13, and a small portion of the lower extremity 14 reversed in pitch. The effect is to assure the desired cross over with less distortion of the cap thread. However, the locking effect is accomplished in substantially the same manner.

FIG. 7 is an embodiment of the invention incorporating both the lug and cross-over principles. The bottle thread has been altered substantially the same as in FIG. 5 but a locking lug 15 has been added to the end of the cap thread 3. In this configuration as the cap is closed

4

the lug 15 will ride over the cross-over guide 10 formed by the detached portion of the bottle thread 2, fall into position beyond the end thereof, and abut against it, locking the cap closed as illustrated.

FIG. 8 is an embodiment of the invention similar in structure to that described in FIG. 6 except that a spur 17 extends from the upper side of the cross-over guide 14 and rides into a detent 18 provided in the end of the cap thread 3.

The above configurations function best when at least one of the interlocking threads is composed of resilient material, compatible with the varying degrees of deformation resulting as the junctions are tightened.

While the principles of the invention have been described in connection with the above specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of the invention; more specifically, the invention could be incorporated in any threaded union where suitable materials are utilized.

What is claimed is:

1. In a threaded joining means comprised of a male spiral threaded element and a complementary female spiral threaded element which cooperates with said male threaded element, an improvement wherein at least one of said threaded elements is composed of resilient material responsive to elastic deformation during the threading of said one element onto the other, and the spiral thread of said one element having a lug extending laterally from the leading end thereof adapted to ride through the threads of said other element and fall over and about the end thereof when said threaded elements are tightly engaged.

2. A threaded joining means and locking mechanism therefor comprised of, a male element having a first spiral thread thereon, and a female element having a second spiral thread thereon complementary to said first spiral thread, one of which elements and its thread is constructed of resilient material, a lug protruding from substantially the leading end of one of said spiral threads, and extending generally laterally to the pitch line thereof, the other of said spiral threads having a detent therein adapted to receive said lug, said detent being so situated as to mate with said lug when said male and female elements are tightly threaded together.

3. An integral thread locking mechanism for a container with a screw cap comprised of a first spiral thread upon the neck of said container, and a second spiral thread internal to said cap complementary to said first spiral thread, at least one of said threads being made of resilient material, said locking mechanism comprising a locking lug on said second spiral thread positioned substantially at the leading end thereof, and protruding generally laterally to the pitch line of said thread, said first spiral thread having a detent therein located substantially at the base thereof, adapted to receive said locking lug, and so positioned that as the cap is tightened and said threads bind, said lug falls into said detent, so that the cap is held tightly against the container top by the action of said complementary threads, and prevented from turning by said locking mechanism.

4. The container and cap comprised of a first spiral thread upon the neck of said container, and a second spiral thread internal to said cap complementary to said first spiral thread at least one of said threads being made of resilient material, wherein a portion of said first spiral thread adjacent its lower extremity is removed creating a gap therein, and wherein the leading end of said second spiral thread is configured to pass through said gap, and frictionally bind therein as said cap is tightened upon said container.

5. The container and cap comprised of a first spiral thread upon the neck of said container, and a second spiral thread internal to said cap complementary to said first spiral thread at least one of said threads being made of

5

resilient material, a cross-thread guide near the lower end of said first spiral thread so shaped and placed as to be comparable to a bending down of the upper end of a detached section at the lower extremity of said first thread to a point where it will intercept the leading end of said second spiral thread as it is threaded thereon and guide it up and over said guide, so as to create a frictional binding force between said second spiral thread and said guide.

6. The container and cap of claim 5 wherein a lug is placed at the end of said second spiral thread, said lug being adapted to ride up and over said cross-thread guide as said cap is tightened, coming to rest on the far side thereof and in such contact with the end thereof as to resist removal of said cap.

7. The device of claim 5 wherein a portion of the said second spiral thread adjacent its leading end is angled toward the top of said cap, so that it will initially slide more easily over said cross-thread guide.

6

8. The container and cap of claim 5 wherein a spur is placed upon said cross-thread guide, and a detent is provided in the leading end portion of said second spiral thread, such that when the end portion of said second thread is forced to ride up said cross-thread guide said detent engages said spur.

References Cited

UNITED STATES PATENTS

10	2,180,357	11/1939	Hothersall	215—46
	2,776,066	1/1957	Thornton	215—44
	2,827,193	3/1958	Martin	215—43
	3,329,293	7/1967	Baumbach	215—43

15 JOSEPH R. LECLAIR, *Primary Examiner*.

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151—14; 215—9, 43