Oct. 9, 1934. R. THOMSON 1,975,878

CLOSURE CAP FOR CONTAINERS

Filed April 28, 1932

Fig. 1.

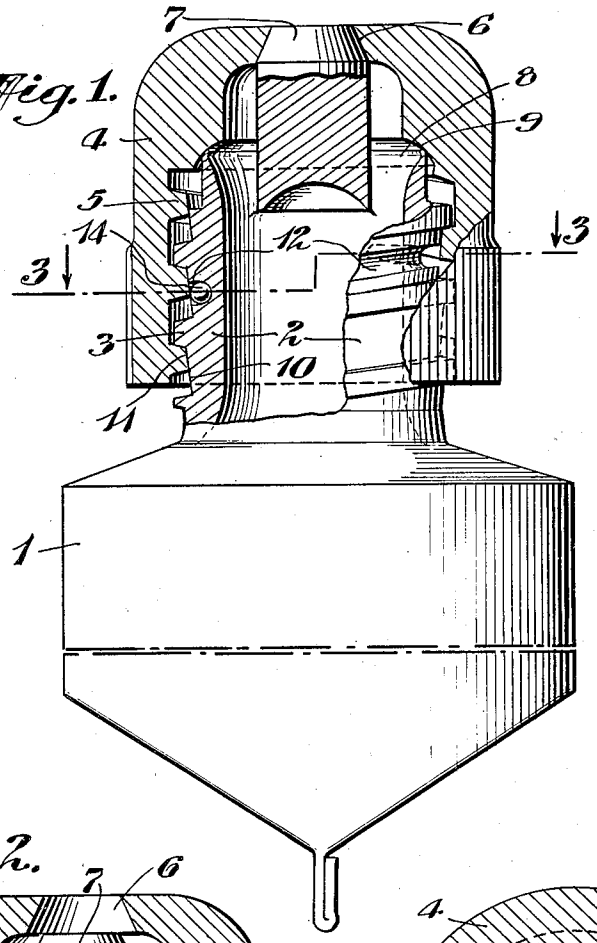


Fig. 2.

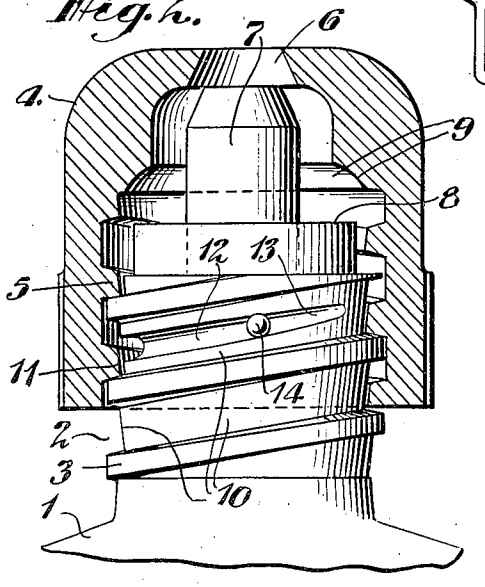
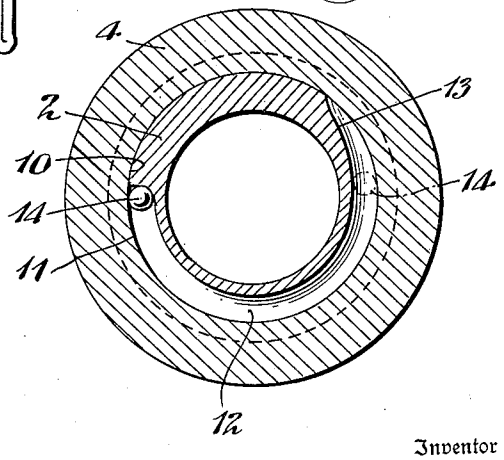


Fig. 3.



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CLOSURE CAP FOR CONTAINERS

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5 Claims. (Cl. 221—60)

Important objects of the present invention are, to provide an improved closure cap structure for a discharge nozzle and to provide an improved threaded closure cap structure for a bottle, paste tube, or similar container, designed to lock the cap tightly closed and also limit unscrewing of the cap and prevent detachment thereof from the container.

Other objects of the invention will appear hereinafter.

In the drawing, Fig. 1 is a sectional side view of a container in the form of a compressible tube embodying the invention;

Fig. 2 is a sectional view showing the closure cap upscrewed to open the container; and

Fig. 3 a transverse section on the line 3—3 of Fig. 1.

The invention is shown embodied in a compressible metal tube container 1 of the type commonly employed to contain tooth paste, shaving cream, and the like. The container has a discharge neck or nozzle 2 formed with an external screw thread 3. A closure cap 4 having an internal screw thread 5 is screwed on the nozzle and formed with a discharge aperture 6. While the invention is shown as combined with a compressible metal tube, it will be understood that the discharge nozzle may be applied to or formed on any suitable receptacle, such as a bottle or jar, made of any suitable material. The closure cap may be made of any suitable material. For application to compressible metal tubes, a cap formed of bakelite will be found satisfactory. At its outer end the nozzle is centrally formed with an outwardly projecting plug 7 which is tapered at its end and forms a needle valve to close the discharge aperture 6. The wall of said aperture is tapered to snugly fit the plug. The diameter of the plug is materially less than the internal diameter of the nozzle and there is clearance at opposite sides of the plug for the contents of the container to flow outward past the plug. At its outer end the nozzle has a thin, tapered annular edge 8 to make a sealing contact with a concave annular wall 9 within the cap and prevent the contents from leaking out through the screw connection. Preferably in making the nozzle the sealing edge 8 is given a slightly excessive length. Then, in screwing the cap home to press the wall of the discharge aperture tightly around the needle valve, the slight excess length of the edge is upset by the curvature of the abutting wall 9 of the cap. This ensures an even, continuous seal.

As so far described, the cap and nozzle structure is of a well known type. My invention relates to improvements in the structure which effect the locking of the closure cap in tightly closed position and limit the unscrewing of the cap to prevent its detachment from the nozzle.

The screw threads 3 and 5 of the nozzle and cap respectively are the well-known Dardelet self-locking type of screw threads disclosed in United States Patent 1,657,244. The threads are complementary threads of constant pitch and have grooves materially wider than their ribs to permit substantial crosswise displacement between the threads upon tightening rotation of one thread on the other without axial advance. Thread 3 has a helicoidal groove bottom or root surface 10 sloping inward at a low angle with reference to the thread axis. The rib of thread 5 has a helicoidal crest surface 11 opposed to the root surface 10 and similarly sloping. These surfaces are coactive locking surfaces to frictionally self-lock the threads together. The ribs of both threads have abutment side faces disposed at an abrupt angle to the thread axis.

The cap may be freely screwed on the nozzle with the rib of the cap thread inwardly displaced in the groove of the nozzle thread and the sloping locking surfaces 10 and 11 backed out of contact. When, however, the axial advance of the cap is arrested by contact of the tapered wall of the discharge aperture 6 with the needle valve, and the cap is further rotated without advance, the rib of the cap thread is displaced crosswise in the groove of the nozzle thread and the locking surface 11 is jammed into frictional locking engagement with the locking surface 10 of the nozzle thread, as shown in Fig. 1. Thereby the cap is firmly held against unscrewing and its discharge aperture is held tightly closed.

The root locking surface 10 of the nozzle thread has formed therein a groove or channel 12 disposed midway between two adjacent medially located rib convolutions of the thread and extending helically therealong. In the present instance the length of said groove somewhat exceeds one turn of the root surface. Its length may vary, however. For most of its length, including its inner end portion, the groove is of uniform size in cross section. Toward its outer or advanced end the groove tapers as indicated at 13, its cross-section gradually diminishing toward the end. A locking ball 14 is fitted in the groove to roll therealong and is confined by the sloping locking surface 11 of the cap thread. This surface 11 is of sufficient width to overlie the ball in all crosswise positions of said surface.

The diameter of the ball slightly exceeds the maximum depth of the groove. The ball may be made of metal or any other suitable material.

As previously described, when the cap is screwed inward on the nozzle the thread crest locking surface 11 is backed away from the root locking surface 10 containing the groove. Thereby the ball is relieved of binding pressure and is freely rotatable by the surface 11 along the groove to the larger end of the groove where it remains during further screwing rotation of the cap without any locking effect. Upon final tightening rotation of the cap without axial advance the consequent displacement of the sloping locking surface 11 will bring the latter into wedging engagement with the ball as shown in Fig. 1. Thereby the ball is held at the inner end of the groove when the cap is locked.

Upon initial unscrewing rotation of the cap the pressure upon the ball is relieved by the backing away of the locking surface 11, and the ball is freely rotatable by said surface along the groove until the tapered outer end portion of the groove is reached. Here the ball is wedged between the groove taper and the locking surface 11 and the latter is thereby locked to prevent further unscrewing of the cap and disconnection thereof from the nozzle. When the cap is screwed inward to closed position the ball 12 is shifted back to the opposite, larger end of the groove where it is clamped by the sloping locking surface 11, as previously described. Retention of the ball at this point ensures that it will always start from the same position when the cap is unscrewed and the unscrewing of the cap will be definitely limited by a definite travel of the ball along the groove.

It will be seen that my invention provides for securely locking the cap closed by mere tightening rotation of the cap and provides for a nice coaction of the thread locking means with the locking ball to limit the opening movement of the cap and prevent its detachment. Thereby the invention corrects two annoying faults in closures for this type of container. These faults are leakage through failure of the cap to remain fully closed and detachment and frequent loss of the cap. While the invention is particularly useful as embodied in a closure cap structure, it may be employed advantageously in other structures.

What I claim is:

1. In combination, a discharge nozzle having an external screw thread, a closure cap having an internal screw thread screwed on said external thread, said cap having a discharge aperture, means between the cap and nozzle to close said discharge aperture when the cap is fully screwed on the nozzle, opposed locking surfaces on said threads coactive upon tightening rotation of the cap to frictionally lock together the threads and hold the cap closed, one of the threads having a groove extending helically therealong and tapering at one end, and a locking element disposed in said groove and engageable by the locking surface of the other thread to shift it along the groove to bind it between the groove taper and said other thread to limit unscrewing of the cap and retain the cap on the nozzle and also engageable by said locking surface at the limit of screwing on of the cap to bind the locking element at the opposite end portion of the groove, the locking element being freely movable by said engaging locking surface back and forth along the groove from one end portion of the groove to the other until it wedges at either end portion of the groove.

2. In combination, a discharge nozzle having an external screw thread, a closure cap having an internal screw thread screwed on said external thread, said cap having a discharge aperture, means between the cap and nozzle to close said discharge aperture when the cap is fully screwed on the nozzle, the engaged threads having clearance therebetween for relative crosswise displacement in an axial direction upon tightening rotation of one thread on the other without axial advance, one thread having a helicoidal locking surface at its crest and the other having an opposed helicoidal locking surface at its root, said surfaces sloping with reference to the thread axis and being coactive for mutual frictional self-locking upon said crosswise displacement and one of said locking surfaces having a groove extending helically therealong and tapered at one end and a locking ball in said groove engageable by the other locking surface to shift it along the groove and bind it between said surface and the groove taper to limit unscrewing of the cap and to shift the ball back along the groove to the opposite end portion of the groove upon screwing rotation of the cap, said ball-engaging locking surface being lockably engageable with the ball upon said crosswise displacement to bind it at said opposite end portion of the groove when the cap is tightened on the nozzle the ball being freely movable by said engaging locking surface back and forth along the groove until it wedges at either end portion of the groove, whereby the groove length traversed by the ball between its locked positions at the opposite end portions of the groove will determine the degree to which the cap may be unscrewed.

3. A screw thread coupling comprising interfitted internal and external screw threads having substantial clearance between their interfitted rib convolutions for relative crosswise displacement of the threads in an axial direction upon tightening rotation of one thread on the other without axial advance, one of said threads having a helicoidal locking surface at its root sloping at a low angle to the thread axis and the other thread having an opposed similarly sloping helicoidal locking surface at its crest, said locking surfaces being coactive for mutual frictional self-locking of the threads upon said crosswise displacement and said root locking surface having a groove extending helically therealong opposed to said crest locking surface and tapering toward one end, and a locking ball in said groove and confined therein by said crest locking surface and shiftable by said crest locking surface along said groove to bind the ball between the groove taper and crest locking surface and limit relative unscrewing of the threads, said sloping crest locking surface being lockably engageable with said ball by said crosswise displacement to bind the ball in the opposite end portion of the groove.

4. In combination, a discharge nozzle having an external screw thread, a closure cap having an internal screw thread screwed on said external thread, said cap having a discharge aperture, means between the cap and nozzle to close said discharge aperture when the cap is fully screwed on the nozzle, the engaged threads having clearance between their interfitted convolutions to permit substantial crosswise displacement of one thread on the other in an axial direction upon

tightening rotation of one thread on the other without axial advance, one thread having a helicoidal locking surface at its crest and the other having an opposed helicoidal locking surface at its root, said surfaces sloping slightly in cross section with reference to the thread axis and being coactive for mutual frictional self-locking upon said crosswise displacement and said sloping root locking surface of one thread having a groove extending helically therealong tapering toward one end and of substantially uniform cross section for the major portion of its length, and a locking element in said groove engageable by said sloping crest locking surface of the other thread to shift it along the groove and bind it between said crest surface and the groove taper to limit unscrewing of the cap, said sloping crest surface being lockably engageable with the locking element upon said crosswise displacement to bind it at the opposite end of the groove when the cap is screw tightened on the nozzle.

5. A screw thread coupling comprising interfitted internal and external screw threads having substantial clearance between their interfitted rib convolutions for relative crosswise displacement of one thread on the other in an axial direction upon screw-tightening rotation of one thread on the other without axial advance, one of said threads having a helicoidal locking surface at its root sloping at a low angle to the thread axis and the other thread having an opposed similarly sloping surface at its crest, said locking surfaces being coactive for mutual frictional self-locking of the threads upon said crosswise displacement, one of said locking surfaces having a groove extending helically therealong and opposed to the other locking surface, and a locking element confined in said groove by said opposed locking surface and freely movable thereby along the groove between points materially spaced apart, by screwing and unscrewing rotation of one thread on the other, the cross section of the groove being restricted at one of said spaced points to wedge the locking element against said opposed locking surface and limit unscrewing, and said opposed sloping locking surface being lockably engageable with the locking element by said crosswise thread displacement to bind the ball at the other of said points.

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