

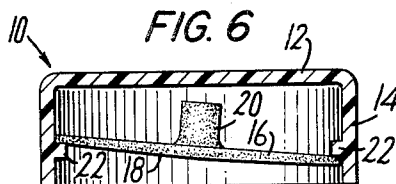
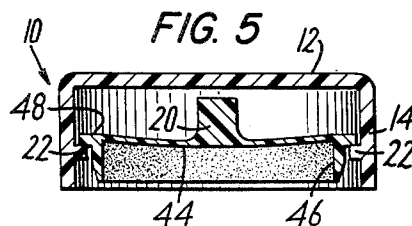
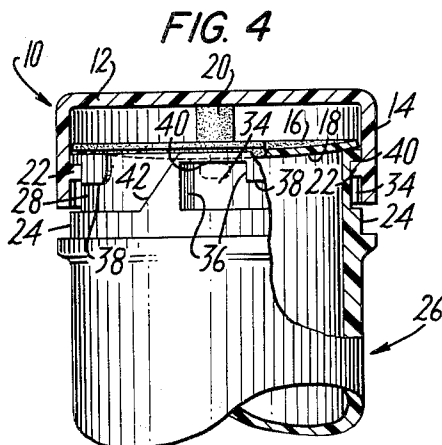
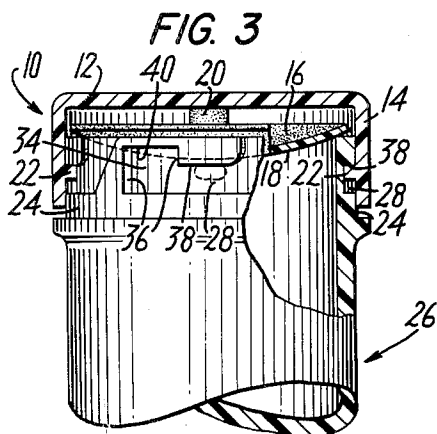
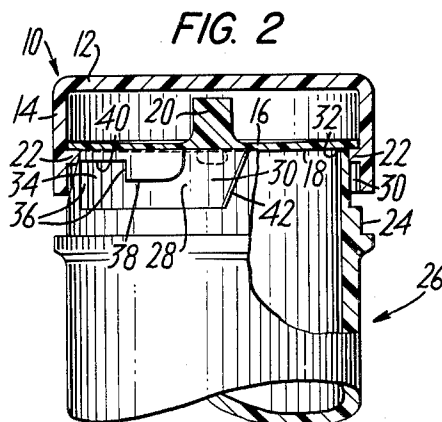
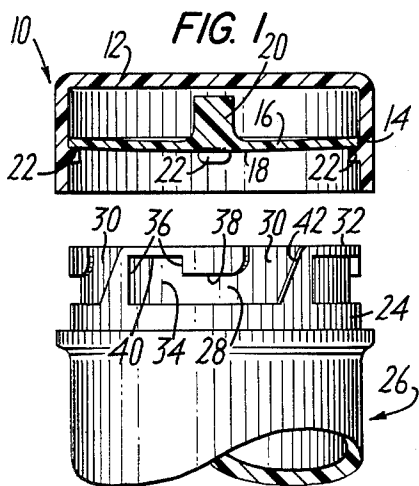
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SPRING MEMBER FOR TAMPER PROOF VIAL

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SPRING MEMBER FOR TAMPER PROOF VIAL

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This invention relates to a closure for self-locking tamper proof type containers and more particularly to a spring member for the closure.

In accordance with the present invention the cap closure for a tamper proof container is provided with a spring member which causes locking elements on the cap to engage retaining slots on the neck of the tubular container in such manner that the cap cannot be removed by mere rotation. Before the cap can be rotated and removed it is necessary to push the cap down against the tension of the spring member in order to disengage the locking members. After the locking members are disengaged the cap may be freely rotated and removed from the mouth of the container.

The spring member of the present invention includes a disc member of resilient plastic material having an upright post or lug adapted to bear against the top of the cap of the closure. When the cap is screwed down over the mouth of the container the disc member contacts the rim of the container and is thereby bowed about the post to provide spring action for locking the cap in place over the mouth of the container.

One great advantage of the spring member of the present invention is that it may be economically made by molding it in the form of an integral piece with inexpensive resilient plastic materials and by simply changing the length of the post the spring action may be changed to provide the desired spring bias in the cap of the closure. The resilient spring member is readily assembled in the cap by merely snapping it past the locking elements in the skirt of the cap which thereafter permanently retain the spring member in operative position in the closure without the need for special retaining means.

These and other advantages of the structure of the present invention may be readily understood by reference to the accompanying drawings in which:

FIG. 1 is an elevation partly in section of the spring member, closure and container.

FIG. 2 illustrates the closure of FIG. 1 positioned over the mouth of the container.

FIG. 3 illustrates the closure of FIG. 1 in position screwed down over the mouth of the container with the spring member bowed ready to cause the locking elements of the cap to engage the retaining slots of the tube.

FIG. 4 illustrates the closure of FIG. 1 in locked position over the mouth of the container.

FIG. 5 is an elevation partly in section of the closure of FIG. 1 having a modified form of the spring member positioned therein.

FIG. 6 illustrates the way in which the spring member is assembled in the closure of FIG. 1.

As shown in FIG. 1 closure 10 has a top wall in the form of a disc 12 having an open ended cylindrical skirt 14. Spring member 16 comprises a disc member 18 in the form of a flat resilient plastic piece which may be of any desired shape such as oval, rectangular and the like in order to fit the cup for which it is intended. In the preferred form of structure shown the disc member is circular and its diameter is such that it may be conveniently fitted into the open ended skirt preferably with slight clearance between the peripheral edge of the disc member and interior wall of the skirt. The disc member has an upright post 20 which is adapted to contact the top wall of the cap. Spring member 16 is a molded

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resilient plastic piece made with resilient plastic material such as polyethylene, polypropylene, nylon, cellulose esters, vinyls, etc.

Because of the resilient nature of the disc member it may be readily supported in the cap of the closure by merely providing a restriction in the skirt below the top wall of the cap so that the cross sectional area of the opening of the skirt will have a dimension which is less than the maximum dimension of the cross sectional area of the disc member. In the preferred form of structure shown the interior wall of skirt 14 is provided with a plurality of protuberances in the form of locking lugs 22 which are spaced equidistant from each other ninety degrees apart around the interior wall of the skirt of the closure. As best shown in the drawings four locking lugs are employed and the distance between interior opposite faces of the locking lugs is less than the diameter of disc member 18.

As illustrated in FIG. 6, spring member 16 is readily assembled in the cap by merely snapping the disc past the locking lugs. The disc member 18, with the post 20 thereon held in upright position relative to the top of closure 10, is placed against the bottom surfaces of the lugs 22 and then the disc is bent upwardly next to the inner end of one of the lugs 22. Bending is continued until the rim of the disc member 18 clears the inner end of lug 22 to snap into the space above the top surface of the lug as shown in FIG. 6. The entire rim of the disc member is snapped past the lugs 22 in this manner and thereafter spring member 16 is permanently supported above the lugs 22 as shown in FIG. 1.

The closure 10 is adapted to cooperate with the neck 24 of a container designated as 26 in the drawings. The neck of the container has a series of annular slots or channels 28 which are open as at 30 along the rim 32 of the neck of the container. The open ends are positioned equidistant around the rim to receive the lugs 22. The closed ends 34 of slots 28 have a greater axial height than the height of the annular portion 28 to provide a notch with retaining edges 36 for the lugs 22.

In fitting the closure 10 to the neck 24 of the container 26, lugs 22 are matched with the open ends 30 of the annular slots 28. In the preferred structure shown post 20 of spring member 16 is spaced slightly away from the top 12 of the closure. With this arrangement the rim 32 of the neck of the container will lift the spring member off lugs 22 causing the top of the post 20 to contact the top of the closure so that lugs 22 will freely enter the open ends 30 a short distance before spring tension is applied. The closure is then pressed down axially to position lugs 22 below shoulders 38 so that the lugs can enter annular slots 28 when the closure is rotated.

As shown in FIG. 3 when lugs 22 are in slots 28 the rim 32 of the neck of the container causes disc member 18 to bend and the resiliency of the disc imparts a spring bias urging the closure upwardly away from the mouth of the container. After the closure has been rotated and lugs 22 have reached the closed ends 34 of annular slots 28, pressure on the closure is released and then spring member 16 moves the closure upwardly until lugs 22 contact the top shoulder 40 to lock the closure in place over the mouth of the container. As shown in the drawings, the top wall of the closure member is made strong enough to withstand the force of the post when the disc member is bent without being permanently distorted or broken. In locked position rotation of the cap is limited by the retaining edges 36 which engage the lugs 22 and prevent the container from being opened. The container can only be opened by pressing the closure down axially against the tension of spring member 16 until lugs 22 are in position to again enter slot 28. Thereafter the cap

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may be rotated and removed from the mouth of the container.

It will be seen that the tension of spring member 16 can be readily changed by changing the height of the post 20 which determines the point when disc member 13 will begin to bend upwardly as the closure is fitted over the neck of the container. If the top of the post is spaced away from the top of the closure initially, then the disc member 13 will only be slightly bowed when lugs 22 enter the annular slots 28. On the other hand, if the top of the post is in contact with the top of the closure initially, then bowing of the disc will be more pronounced when the lugs enter the annular slots and the spring bias will be proportionately increased. With the latter type of structure a spring member of highly resilient material such as polypropylene can be made to provide a fluid tight seal on the rim of the container. However, if a fluid tight seal is not necessary the post 20 is initially spaced away from the top of the closure so that the container can be readily opened or closed without too much effort on the part of the user.

In some cases it may be desirable to lock the cap on the container so that it will be virtually impossible to remove the cap without breaking the container. This may be done by making post 20 long enough to bear against the top of the closure and bow the disc member so that it is tensioned against locking lugs 22 before the closure is placed over the mouth of the container. In such case considerable force is required to lock the closure in place over the mouth of the container and if the post is made long enough even an adult will be unable to remove the cap without breaking the container.

In the container shown in the drawings, an inclined shoulder 42 is provided at the open ends of the annular slots which operates as a cam to guide lugs 22 toward the annular slots 28 when the closure is first pressed down over the mouth of the container. This permits the use of relatively wide entrance openings for slots 28 along the rim of the neck of the container and the cam surfaces insure that the lugs on the closure will be properly aligned and cammed into the annular slots 28.

FIG. 5 shows a modified form of the spring member positioned in the closure 10. The interior portion 44 of the disc member is slightly dished giving it a slightly concavo-convex cross section and an annular depending flange 46 is provided and made integral with the bottom of the disc member. The thickness of the dished portion 44 is substantially less than that of the peripheral border 48 of the disc member which is adapted to rest on top of the locking lugs 22. The outside diameter of the annular flange 46 is selected to give an interference friction fit with the inside wall of the mouth of the container 26. When the closure is fitted over the neck of the container the interior portion 44 of the modified spring member is bowed by post 20 to give spring action, and the annular flange 46 frictionally engages the inside wall of the mouth of the container to provide a liquid seal. Since the central portion of the disc member is dished and relatively thin it can readily stretch to a more pronounced curvature when subjected to the pressure of post 20 without any substantial bowing of the peripheral border portion 48. As a result there is little if any lateral force exerted by the annular flange 46 which remains substantially rigid and undistorted throughout the manipulative steps required to close the container. When the container is opened the locking lugs 22 retain the spring member within the closure 10 so that the spring member is readily pulled out of the mouth of the container.

The modified spring member when used in accordance with the invention gives a highly efficient liquid tight seal but it will be understood that the annular flange is not essential to the basic function of the spring members and the modified form of spring member without the annular flange can be satisfactorily used for providing the required spring action in the closure. Also if desired the

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annular flange can be incorporated in the structure of the spring member of FIG. 1 without departing from the scope of the present invention.

In the container shown in FIGS. 1 and 5 bowing of the disc portion of the spring member is sufficiently limited so as to preclude contact between the peripheral portion of the disc and the top of the closure. The peripheral portion of the disc may however make contact with the top of the closure as long as the lugs 22 at that time or thereafter upon application of additional pressure on the closure can be made to enter the annular slots on the neck of the container. Of course when pressure on the closure is released the bias of the spring member will move the closure upwardly to lock it in place over the mouth of the container and when this occurs the edge of the spring member will be out of contact with the top of the closure until the time when the closure is again depressed to open the container.

The self locking tamper proof container illustrated in the drawings is a preferred form of structure but it will be obvious to those skilled in the art that the spring member of the present invention need not be in the form of a cylindrical disc but may be of any desired shape to fit the particular tamper proof closure for which it is intended.

It will be further understood that it is intended to cover all changes and modifications of the preferred embodiment of the invention herein chosen for the purpose of illustration which do not constitute departures from the spirit and scope of the invention.

I claim:

1. A self locking tamper proof vial which comprises the combination of a closure member a container with a cylindrical open neck portion and a spring member, said closure member having a top wall and a cylindrical skirt portion, the cylindrical skirt portion having a plurality of projections spaced around the interior surface thereof and positioned in spaced relationship to the top portion of the closure member, said spring member having a resilient disc portion with a post positioned on one side thereof, said spring member being positioned in the closure in the space between the projections and top portion of the closure member and disc member, said spring member being supported by the plurality of projections in the space between said projections and the interior surface of the top portion of said closure member said container having a number of grooves around the cylindrical open neck portion each with one closed upright end terminated below the rim of said neck and an opposite end open at the rim of said neck, said grooves being spaced around the neck at intervals similar to the spacing of the projections of said closure member so then when closure is properly positioned over the rim of the neck and pressed to the neck the projections enter the open end of said grooves and the post of said spring member is pushed upwardly against the top wall of said closure by the force of the rim of the neck portion against the disc portion of the spring member, said top wall being strong enough to withstand the force in the post without being permanently distorted or broken, whereby if the closure is pressed to the neck of the container and then rotated so the projections enter the closed upright end the force of the disc portion of the spring member on the rim of the neck will keep the projections in the closed upright ends of the slots so the open neck of the container is sealed to form a tamper proof vial.

2. The closure in accordance with claim 1 in which the top of the upright post portion of the spring member is spaced away from the interior surface of the top portion of the closure member.

3. The closure in accordance with claim 1 in which the top of the upright post portion of the spring member is in contact with the interior surface of the top portion of the closure member.

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4. The closure in accordance with claim 1 in which the spring member is made from polypropylene.

5. The combination of a closure member, a spring member and a container having an open neck portion, said closure member having a top wall, a cylindrical skirt portion, and a plurality of projections spaced at equal intervals around the interior side wall of the skirt portion, said spring member having a disc portion and a centrally located post portion integral with one side of the disc portion, the diameter of the disc portion being slightly smaller than the interior diameter of the cylindrical skirt portion of said closure member, said spring member being made of resilient material and being supported within the cylindrical skirt portion by the plurality of projections thereof in a position such that the integral post portion is upright relative to said closure member, said open neck of the container having a plurality of annular slots, each having one closed upright end terminating below the rim of said open neck and an opposite upright end open at the rim of said open neck, the open ends of the annular slots being spaced at intervals similar to the spacing of the projections of said closure member whereby the projections enter the open ends of said annular slots, travel through said annular slots and enter the closed upright ends of said annular slots and whereby the projections are urged to interlock with the sides of the closed upright ends by the spring bias of said spring member the post of said spring member being in contact with the top wall of said closure and the resilient disc portion being bent upward axially by the rim of said open neck when said closure member is pressed down axially on said open neck of the container and rotated relative to said container and released said top wall of the closure being strong enough to withstand the force of the post without being permanently distorted or broken.

6. A self locking tamper proof vial comprising a cap having a top wall and an open ended skirt portion projecting down from said top wall, a spring member comprising a substantially flat resilient plastic disc member having an upright post on one side thereof adapted to bear against the top wall of the cap and hold the resilient plastic disc member in spaced relationship thereto, said open ended skirt having projections in the opening thereof to provide an opening of cross sectional area having a dimension which is less than the maximum dimension of the cross sectional area of said resilient disc member, said projections being positioned in the skirt below said resilient disc member whereby the disc member will be held in operative position in the cap and a container with an open neck portion having a number of grooves around its exterior surface, each with a closed upright end terminated below the rim of said neck and an opposite end open at the rim of said neck, said grooves being spaced around the neck at intervals similar to the spacing of the projections of said cap so then when cap is properly positioned over the rim of the neck and pressed to the neck the projections enter the open end of said grooves and the post of said spring member is pushed upwardly against the top wall of said closure by the rim of the neck portion pushing against the disc portion of the spring member, said top wall being strong enough to withstand the force in the post without being permanently distorted or broken, whereby if the cap is pressed to the neck of the container and then rotated so the projections enter the closed upright ends the force of the disc portion of the spring member on the rim of the neck will keep the projections in the closed upright ends of the slots so the open neck of the container is sealed to form a tamper proof vial.

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7. A structure as specified in claim 5 in which the projections in the open ended skirt are formed by means of protuberances positioned on the interior wall of the skirt.

8. A structure as specified in claim 6 wherein said projections are in the form of a plurality of lugs spaced equidistantly apart around the interior wall of the skirt.

9. A self locking tamper proof vial comprising a cap having a top wall and an open ended skirt portion projecting down from said top wall, a spring member therein comprising a resilient plastic disc member an interior portion of which is concavo-convex in cross section, the concave side thereof having a centrally located post and the convex side thereof having an annular flange projecting down below the surface of the disc which is adapted to make an interference friction fit with the inside wall of the container for which the cap is intended, said post being adapted to bear against the top wall of the cap and hold the resilient plastic disc member in spaced relationship thereto, said open ended skirt having projections in the opening thereof to provide an opening of cross sectional area having a dimension which is less than the maximum dimension of the corresponding area of said resilient disc member, said projections being positioned in the skirt below said resilient disc member whereby the disc member will be held in operative position in the cap and a container with an open neck portion having a number of grooves around its exterior surface, each with a closed upright end terminated below the rim of said neck and an opposite end open at the rim of said neck, said grooves being spaced around the neck at intervals similar to the spacing of the projections of said cap so then when cap is properly positioned over the rim of the neck and pressed to the neck the projections enter the open end of said grooves and the post of said spring member is pushed upwardly against the top wall of said closure by the rim of the neck portion pushing against the disc portion of the spring member, said top wall being strong enough to withstand the force in the post without being permanently distorted or broken whereby if the cap is pressed to the neck of the container and then rotated so the projections enter the closed upright ends the force of the disc portion of the spring member on the rim of the neck will keep the projections in the closed upright end of the slots so the open neck of the container is sealed to form a tamper proof vial.

10. A structure as specified in claim 9 in which the projections in the open ended skirt are in the form of a plurality of lugs spaced equidistantly apart around the interior wall of the skirt.

11. A structure as specified in claim 9 in which the thickness of the concavo-convex portion of the disc member is substantially less than the thickness of the remaining portion of the disc member.

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