Jan. 1, 1957 E. H. E. THORNTON 2,776,066

CLOSURE FOR CONTAINERS

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Fig. 1.

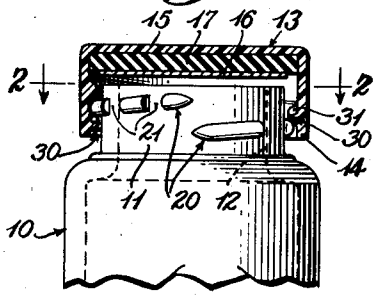


Fig. 3.

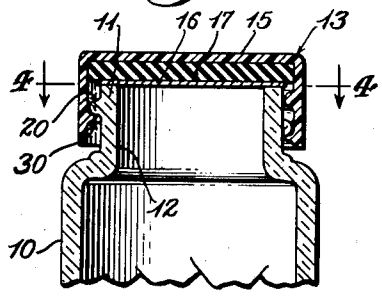


Fig. 2.

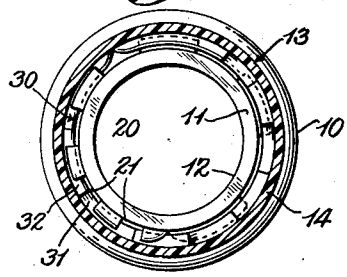


Fig. 4.

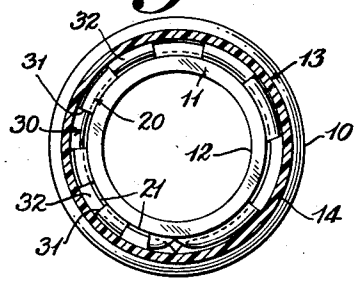


Fig. 5.

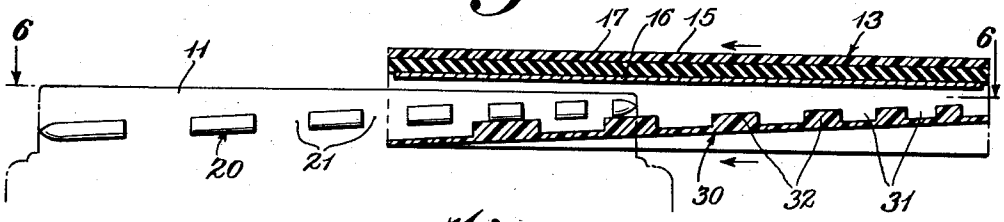
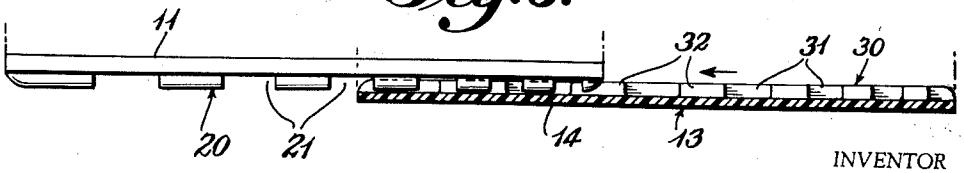


Fig. 6.



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Fig. 7.

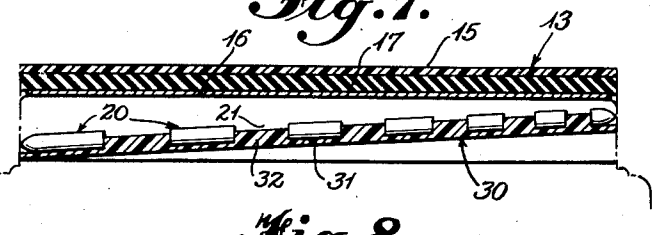


Fig. 8.

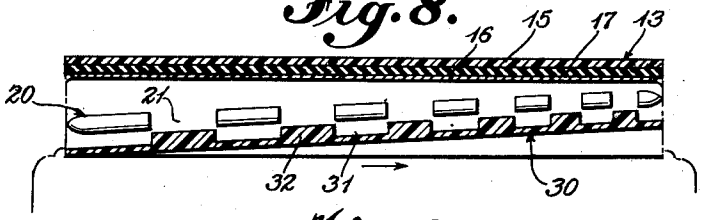


Fig. 9.

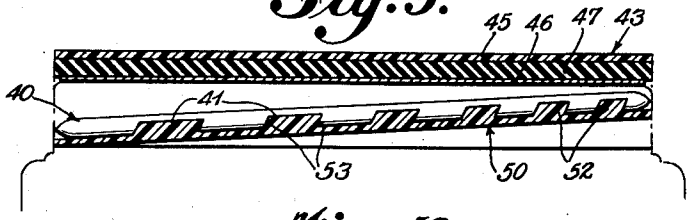


Fig. 10.

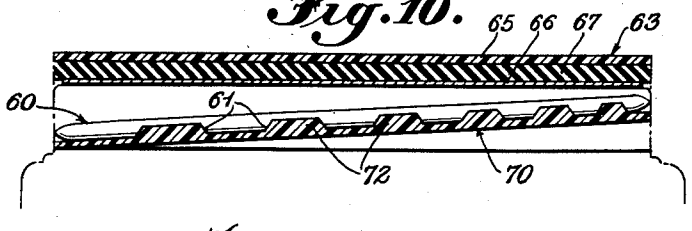


Fig. 11.

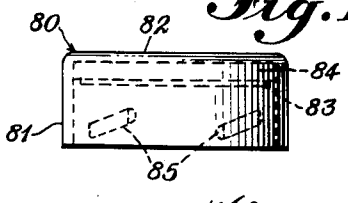


Fig. 12.

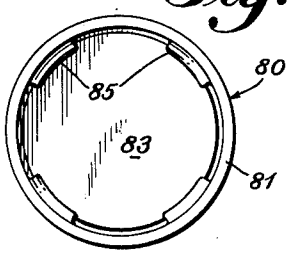
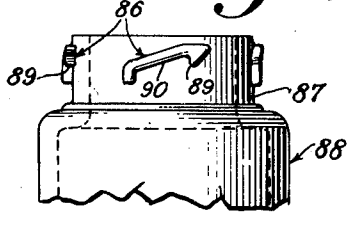


Fig. 13.



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2,776,066

CLOSURE FOR CONTAINERS

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Application August 20, 1954, Serial No. 451,149

3 Claims. (Cl. 215—44)

This invention relates generally to a closure for containers. More particularly the invention is directed to a container closure for bottles, jars and like containers embodying cooperating locking parts on screw thread elements carried respectively by the closure and container, whereby specific manipulation of the closure relative to the container is required to effect removal of the closure therefrom.

The ever present danger to small children and infants of their accidentally consuming fatal or near fatal dosages of various medications in tablet or fluid form has long been recognized. Medicaments and other dangerous materials such as poisons are traditionally dispensed in bottle containers. These containers, when left in a position accessible to infants and younger children, offer an ever present inducement to sample the contents of the container.

Recognizing the dangers present in the indiscriminate consumption of medicaments or other harmful materials by children, the present invention is particularly directed toward providing a container closure which may be simply removed from the container by appropriate manipulation by an adult while such manipulative procedure for removal of the closure is beyond the mental comprehension of an infant and/or the physical power of such infant. Thus, upon applying the closure to its container the danger of accidental or intentional removal of the closure from the container by an infant or small child is precluded.

Accordingly it is a principal object of this invention to provide a container closure having a cam surface disposed on its cylindrical skirt portion to engage with a cam surface on the neck portion of the container, with the cam surfaces having mating parts cooperable in one position of orientation of the closure relative to the container to restrain the closure and container against relative rotational movement together with resilient biasing means disposed between the closure and container to urge the mating parts into rotation restraining cooperation.

It is a further object of this invention to provide an interlocking container and closure structure having cooperating screw thread elements disposed on the closure skirt portion and the container neck portion with the engaging surfaces of said thread elements having mating indentations and projections spaced at different distances along the length of the thread elements so that upon rotation of said closure relative to said container a point will be reached where registration of the indentations and projections occurs together with resilient means between the container and closure to urge movement of the mating indentations and projections into registration to lock the closure on the container.

It is an additional object of this invention to provide an interlocking container and closure structure having cooperating screw thread elements on the closure skirt portion and the container neck portion, one of said thread elements having a projection at the outer leading end thereof providing a pocket inwardly of the projection to

receive and retain the other thread element together with resilient biasing means to urge the other thread element into the pocket on said one thread element to thereby lock the cap and bottle against relative rotational movement.

Other objects and advantages of the invention will be apparent with reference to the following description of specific embodiments of the invention taken in connection with the accompanying drawing in which:

Figure 1 is a side elevation partially in section with the closure partially applied to the container;

Figure 2 is a sectional view taken on line 2—2 of Figure 1;

Figure 3 is a sectional view showing the closure fully applied to the container to seal the open top thereof;

Figure 4 is a sectional view taken on lines 4—4 of Figure 3;

Figure 5 is a developed view of the mating screw thread elements shown in their relationship with the closure and container as in Figure 1;

Figure 6 is a developed view taken on line 6—6 of Figure 5;

Figure 7 is a developed view showing the relationship of the screw thread elements with the closure locked on the container as in Figure 3;

Figure 8 is a view similar to Figure 7 but showing the position of the thread elements with their mating parts disengaged by the application of pressure to the top of the closure;

Figure 9 is a view similar to Figure 7 illustrating a modified form of mating parts on the screw thread elements;

Figure 10 is a view similar to Figure 9 illustrating a further modified form of mating parts on the screw thread elements;

Figure 11 is a side elevational view illustrating a closure having separate thread segments making up the screw thread element;

Figure 12 is a bottom plane view of the closure of Figure 11; and

Figure 13 is a side elevational view of a container having thread segments formed to lockingly cooperate with the thread segments on the closure of Figures 11 and 12.

Referring specifically to the drawings and more particularly Figures 1 through 4, there is shown thereon a container **10** such as a bottle or jar which may be of glass, plastic, metal or other suitable material. This container has a neck portion **11** providing an opening **12** for the introduction and removal of material from the container **10**.

A closure **13** in the form of a cap of plastic, metal or other suitable material having a cylindrical skirt portion **14** and a circular top portion **15** is provided to cooperate with neck portion **11** in sealing opening **12**. A sealing disc **16** is positioned within the skirt portion **14** adjacent the top portion **15** and is normally held in spaced relation to top portion **15** by a resilient layer **17**. The resilient layer **17** may take the form of sponge rubber such as specifically illustrated on the drawings or other suitable yieldable material. On the other hand, within the scope of the instant invention resilient spring means may be substituted for the resilient layer **17** so that such spring means will yieldably retain the sealing disc **16** spaced from the top portion **15**. The purpose and function of yieldably supporting the sealing disc relative to the top of the cap is more fully explained hereinafter.

The neck portion **11** of container **10** is provided with a screw thread element **20**. This element helically encircles the neck portion **11** and, as illustrated, is provided with indentations or interruptions **21**. The indentations **21** are formed of progressively increased length with the length of the first indentation at the leading end of the

thread element 20 being the shortest and each succeeding indentation 21 being progressively longer in length toward the end of the thread element 20. The relationship between the lengths of indentations or interruptions 21 and spacings therebetween is more clearly illustrated by the developed views of the thread elements as shown in Figures 5 through 8.

The interior of the skirt portion 14 of closure 13 is provided with a helical screw thread element 30. This element extends radially inwardly from the interior surface of skirt portion 14 and is provided at spaced positions along its length with notches or indentations 31. The notches 31 are of varying length commencing from the leading end of the thread element 30 and progressively increasing in length toward the end of such thread element. Notches 31 provide along the length of thread element 30 a series of longitudinally spaced projections 32.

The relative size in length and spacing of the projections 32 in comparison with the indentations 21 is such that upon appropriate relative movement of closure 13 relative to container 10, the respective thread elements will be moved to a point where projections 32 will matingly register with indentations 21. At all other positions of orientation of closure 13 relative to container 10, the mating projections 32 and indentations 21 will not be in proper aligned registration and therefore the thread elements carried respectively by the container and closure will be effective as ordinary screw threads to urge, upon relative rotation of the members, the closure 13 on or off of container 10, depending on the direction of relative rotation between the two members.

Figure 1 illustrates the relationship of the thread elements 20 and 30 when the closure 13 is only partially screwed on to the container 10. It will be noted that, as shown in this figure and from the developed views of Figures 5 and 6, the projections 32 are not so related to the indentations 21 at this partially applied position as to registerably cooperate therewith.

Upon continued rotation of closure 13 relative to container 10, toward container closing, the thread elements urge the closure 13 axially inwardly toward a position where sealing disc 16 engages the outer end of neck portion 11. Desirably, at this time the projections 32 are not yet aligned with indentations 21 so as to permit mating registration of these parts. As rotation of closure 13 is continued, the resilient layer 17 is compressed between disc 16 and the top portion 15 of closure 13. The compression of resilient layer 17 sets up a biasing action which urges the closure 13 outwardly relative to container 10 and thereby forces the thread elements 20 and 30 into firm engagement.

As shown more clearly in Figures 7 and 8, as the projections 32 are moved by orientation of closure 13 relative to container 10 to a point where they matingly register with the indentations 21, the biasing force created by the compression of resilient layer 17 is effective to draw the projections 32 into registration with the mating indentations 21. The slight outward movement of closure 13 relative to the container 10 results in partial relieving of the compression of resilient layer 17. However, ideally, the extent of outward movement is so limited as to leave layer 17 partially under compression so that disc 16 will be retained in firm sealing engagement with the outer end of neck portion 11 of container 10.

As the projections 32 move axially into registration with the indentations 21, it will be apparent that further relative rotation between the closure 13 and the container 10 is precluded. In other words, the registration of these parts results in locking the closure 13 against removal from the container 10.

As desired, for removal of the closure 13 from the container 10, axial pressure is applied against the top portion 15 of the closure to move it downwardly compressing layer 17 and moving the thread element 30 carrying projections 32 axially relative to the thread element 20 having indentations 21. The relative positions of the members as such an axial force is applied to top portion 15, is illustrated in Figure 8. Upon effecting such freeing of the projections 32 from indentations 21, the closure 13 may be rotated relative to container 10 for removal of the closure therefrom. It will be appreciated that once the projections 32 have been moved slightly out of registration with indentations 21, the axial force applied to top portion 15 may be relieved since the thread elements 20 and 30 may then operate as ordinary screw threads in permitting unscrewing of the closure from the neck portion of the container.

It will be readily appreciated that the continuity of thread element 30 insures that the projections 32 will not pass completely through indentations 21 so that the closure would move axially off of the neck portion of the container. In other words, notches or indentations 31, by not extending completely through the thread element 30, provide a base or stop which engages the portion of the thread element 20 intermediate the indentations 21 and thereby limits outward movement of the closure upon alignment of the indentations and projections for interengagement.

Although as illustrated, the indentations have been shown as formed in the thread element carried by the neck portion of the container with the projections carried by the thread element on the skirt portion of the closure, it will be readily recognized that within the scope of the instant invention the relationship may be reversed with the indentations formed on the thread element of the closure and the projections formed on the thread element of the container. Further it will be appreciated that a variety of modified cooperating thread elements may be employed within the contemplation of the instant invention, such thread elements being provided with mating parts which will register upon moving the closure and container to a predetermined relative orientation of the closure relative to the container.

Of particular importance in the instant invention is the spacing and/or size relationship between the mating parts carried by the respective thread elements of the closure and container. As illustrated, the indentations and projections are formed of progressively increasing length so that registration between these parts cannot occur until the closure has been rotated to a point where all of the projections are disposed opposite indentations equal in length to the respective projections. Various equivalent structures can be visualized which would be equally as effective, as by uniformly sized projections and indentations distributed at progressively increased distances along the length of the engaging thread elements, or projections and indentations of progressively increased length positioned at equal distances along the length of the thread elements.

All of these modifications within the contemplation of the instant invention call for a structure wherein the closure may rotate smoothly and evenly into closing position for the container up to a point where the projections coincide with the indentations so that axial movement of the closure is permitted by the biasing means carried in the top of the closure to effect locking of the closure on the container. By providing for simultaneous interengagement of a plurality of mating parts to interlock the closure on the container, increased strength is imparted to the overall structure since any torque applied to the closure to remove it without disengaging the mating parts is evenly distributed to the plurality of interengaged parts without concentrating such torque load on only one set of interengaged parts. Thus the possibility of shearing the mating parts from the screw thread elements by a twist of the closure is lessened.

Figure 9 illustrates a container and closure device embodying the principles of the structure described hereinabove while illustrating an alteration in the forming of the indentations and projections which will result in firmer locking of the closure on the container when an attempt is made to unscrew the closure without initially forcing

the closure downwardly to disengage the registered projections and indentations. In the structure described hereinabove with regard to Figures 1 through 8, the sides of the projections 32 and indentations 21 are shown as extending generally parallel to the axis of rotation for the closure relative to the container. With this straight side wall relation between the indentations and projections, the closure is moved axially by pressure applied to the top portion to disengage such parts to unscrew the closure from the container.

In Figure 9 a screw thread element 40 is disposed around the neck portion of the container and is provided with pockets or indentations 41 at longitudinally spaced positions along the length of the thread element. The closure 43, having a top portion 45, a sealing disc 46 and a resilient layer 47, carries a thread element 50 having projections 52 disposed at spaced positions longitudinally thereof to coincide with the length, size and spacing of the indentations 41 on thread element 40. The side walls 53 of the projection 52 are parallel and disposed diagonally of the axis of rotation of closure 43 relative to the container. The indentations 41 on thread element 40 have the side walls thereof similarly formed to matingly cooperate with the projections 52.

Figure 9 illustrates the position of the thread elements 40 and 50 when closure 43 is lockingly secured on the container. An attempt to unscrew closure 43 without first axially moving the closure would result in the leading sloping walls 53 of projections 52 tending to move into more positive locking engagement with the indentations carried by the thread element 40. Thus with such a relationship between the side walls of the indentations and projections, a more positive locking action is secured if a person attempts to remove closure 43 without initially disengaging the projections 52 from registration with indentations 41.

Figure 10 illustrates a further modification of the relation between the indentations and projections carried by the respective thread elements of a closure and container. As shown in this figure, the thread element 60 is provided with outwardly flaring indentations 61 and a closure 63, having a top portion 65, a sealing disc 66 and resilient layer 67, carries a thread element 70 having tapered projections 72 formed at spaced positions therealong corresponding in size and spacing to indentations 61 on thread element 60. In Figure 10 the closure and container are shown positioned in their interlocked state. Normally, to remove closure 63 from the container axial force is applied, compressing layer 67 and disengaging projections 72 from registration with indentations 61. However, by reason of the flared relationship of indentations 61 to the tapered form of projections 72 it is possible by application of sufficient torque to the closure 63 to cause the projections 72 to ride downwardly out of engagement with indentations 61 and thence permit unscrewing of the closure from the container.

Figures 11, 12 and 13 illustrate a further modification embodying the features of the instant invention. In this embodiment a closure 80 having a skirt portion 81 and top portion 82 is provided with a sealing disc 83 supported on a resilient layer 84. A screw thread element consisting of a group of thread segments 85 is provided on the interior wall of the skirt portion 81. The thread segments 85 are disposed at equally spaced positions around the periphery of the skirt portion 81 and are disposed at an angle to cooperate with corresponding thread segments 86 carried on the outer surface of the neck portion 87 of a container 88.

The thread segments 86 are equal in number to the segments 85 and are located on neck portion 87 at uniformly spaced distances around the periphery thereof. The outer leading end of each thread segment 86 is provided with a projection 89 which forms a pocket or indentation 90 adjacent the underside of the thread segment. The length of the thread segments 85 carried interiorly of skirt portion 81 of the closure is such as to be received within the pockets 90 formed on the underside of the thread segments 86 carried by the container 88.

In operation of the embodiment illustrated in Figures 11 through 13, the closure 80 is moved downwardly on to the neck portion 87 of container 88 with thread elements 85 moving between the adjoining ends of adjacent thread segments 86. Rotation of closure 80 relative to container 88 causes the thread elements on the closure and container to cooperate and force the closure down into sealing engagement with the end of the neck portion 87, thus compressing resilient layer 84 between disc 83 and top portion 82 of the closure. Continued rotation of the closure 80 results in the thread segments 85 sliding beneath the projections 89 of the respective thread segments 86.

After such thread segments 85 have passed completely beneath projections 89 by relative rotation of the closure and container, the compressive force built up in resilient layer 84 will be effective to urge closure 80 axially outwardly to move the respective thread segments 85 into the pockets 90 formed on the underside of thread segments 86. After this limited outward movement, ideally, compression of layer 84 will not have been completely expended so that in the final analysis disc 83 will still be in firm sealing engagement with the end of neck portion 87. It will of course be recognized that to disengage closure 80 from this interlocking connection with container 88, it is merely necessary to force the closure axially inwardly to disengage the parts from their mating registration and thereafter rotate the closure relative to the container for removal of the closure therefrom.

Having thus described my invention, what I claim is:

1. The combination of a container having an open neck portion; a closure for said container having a cylindrical skirt portion; cooperating screw thread elements carried respectively by said neck portion and said skirt portion engageable upon rotation of said closure relative to said container to draw said closure axially into sealing relation with the opening of said neck portion, each of said screw thread elements extending around a substantial portion of the circumference of said neck and skirt portions respectively and having a plurality of indentations spaced at intervals along the length of said elements providing between said indentations a plurality of projections, the indentations of one of said screw thread elements being spaced at varying distances from one another, the projections of the other of said elements having a length and spacing similar to the length and spacing of the indentations of said one element so that said projections and indentations coincide when said elements are fully engaged, said varying distances being such that said screw thread elements are engaged by rotation of said closure relative to said container without obstruction caused by mating registration of the indentations of said one element with the projections of said other element except at one predetermined relative position of said screw thread elements where said elements are fully engaged and said indentations and projections coincide, at least one of said screw thread elements having stop means axially aligned with the indentations of said one element to engage the projections of the other of said elements and prevent axial withdrawal of said closure from said container when said projections and indentations are in mating registration; and resilient means disposed between said closure and said container to urge said projections and indentations into mating registration at said one position to interlock said closure relative to said container.

2. The combination as recited in claim 1 wherein the spaces between adjacent ones of the indentations of said one thread element and projections of said other thread element are of progressively increased length from one end of said thread elements to the other.

3. The combination of a container having an open

neck portion; a closure for said container having a cylindrical skirt portion; a first screw thread element carried by said neck portion, a second screw thread element carrier by said skirt portion for cooperation with said first screw thread element, each of said elements extending in a helical line around substantially the entire circumference of said neck and skirt portions respectively, each of said screw thread elements having a plurality of indentations spaced at intervals along the length thereof providing between said indentations a plurality of projections, the indentations of one of said screw thread elements being spaced at varying distances from one another, the projections of the other of said elements having a length and spacing similar to the length and spacing of the indentations of said one element so that said projections and indentations coincide when said elements are fully engaged, said varying distances being such that said screw thread elements are engaged by rotation of said closure relative to said container without obstruction caused by mating registration of the indentations of said one element with the projections of said other element except at one predetermined relative position of said screw thread elements where said elements are fully engaged and said

indentations and projections coincide, at least one of said screw thread elements having stop means axially aligned with the indentations of said one element to engage the projections of the other of said elements and prevent axial withdrawal of said closure from said container when said projections and indentations are in mating registration; and resilient means disposed between said closure and said container to urge said projections and indentations into mating registration at said one position to interlock said closure relative to said container.

References Cited in the file of this patent

UNITED STATES PATENTS

1,514,337	Rappenecker	Nov. 4, 1924
1,621,487	Aulbach	Mar. 22, 1927
1,659,703	Ramsey	Feb. 21, 1928
1,887,700	Stevens	Nov. 15, 1932
1,988,383	Hermani	Jan. 15, 1935
2,623,657	De Vries	Dec. 30, 1952
2,627,997	Wittenberg	Feb. 10, 1953
2,701,030	Hazelton	Feb. 1, 1955