

May 27, 1941.

L. A. VON TILL ET AL

2,243,138

DEVICE FOR FORMING SCREW CLOSURE CAPS AND SIMILAR ARTICLES

Filed April 1, 1938

3 Sheets-Sheet 1

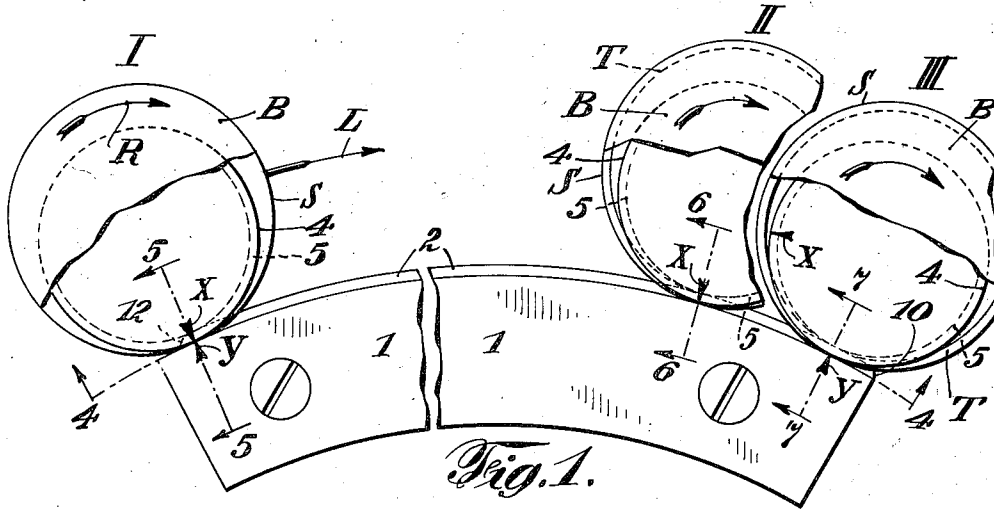


Fig. 1.

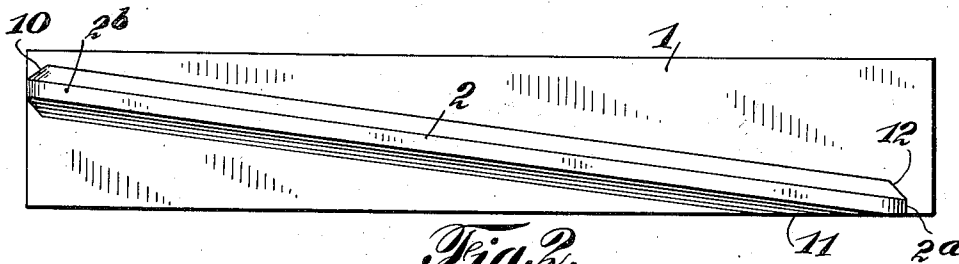


Fig. 2.

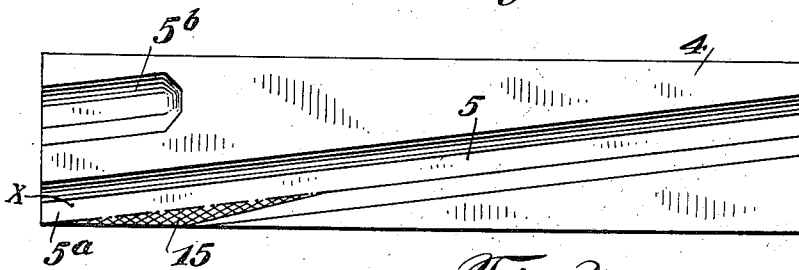


Fig. 3.

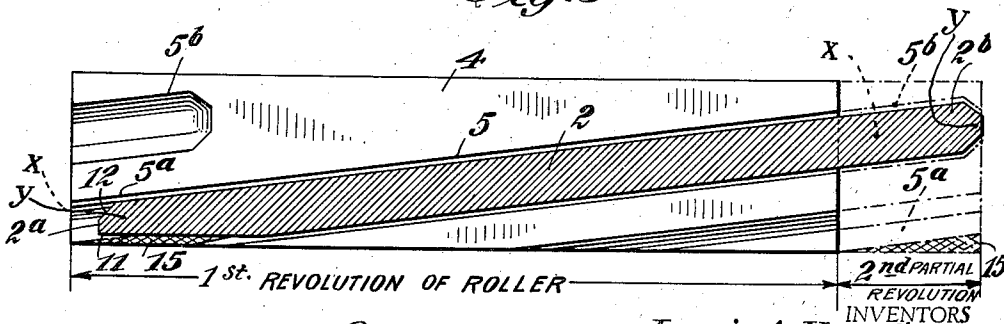


Fig. 4.

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3 Sheets-Sheet 2

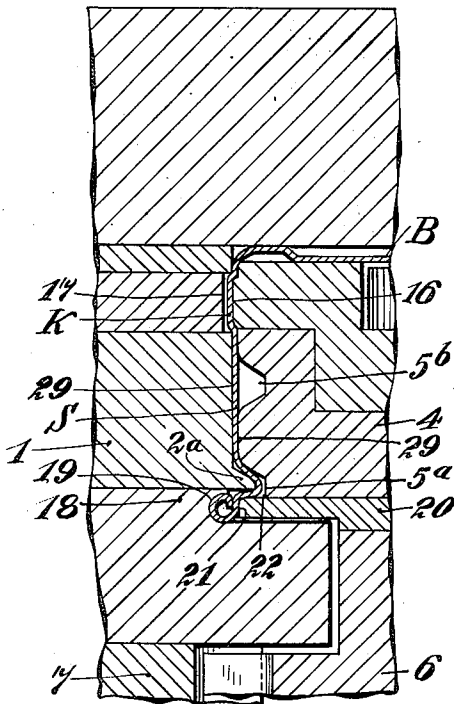


Fig. 5.

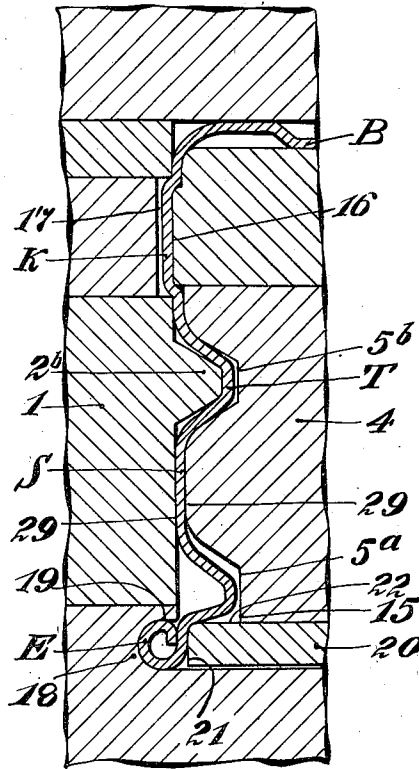


Fig. 7.

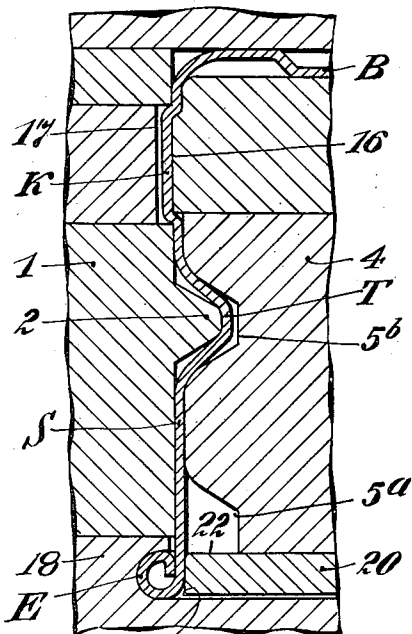


Fig. 6.

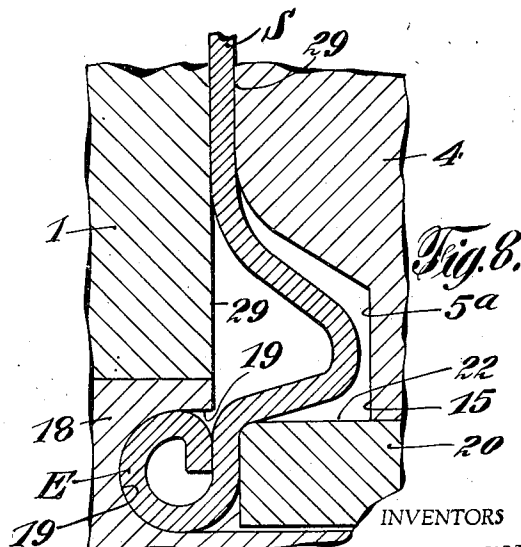


Fig. 8.

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3 Sheets-Sheet 3

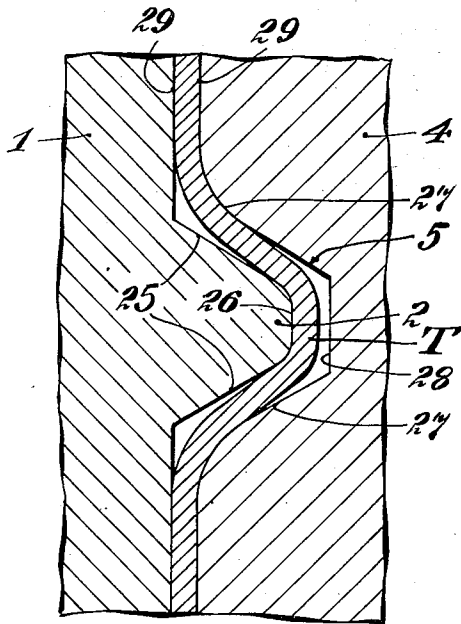


Fig. 9.

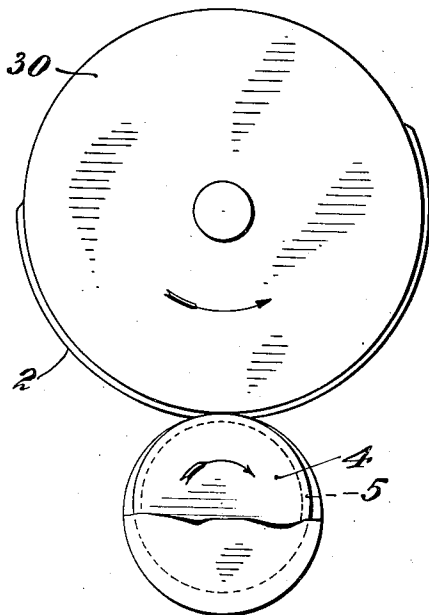


Fig. 10.

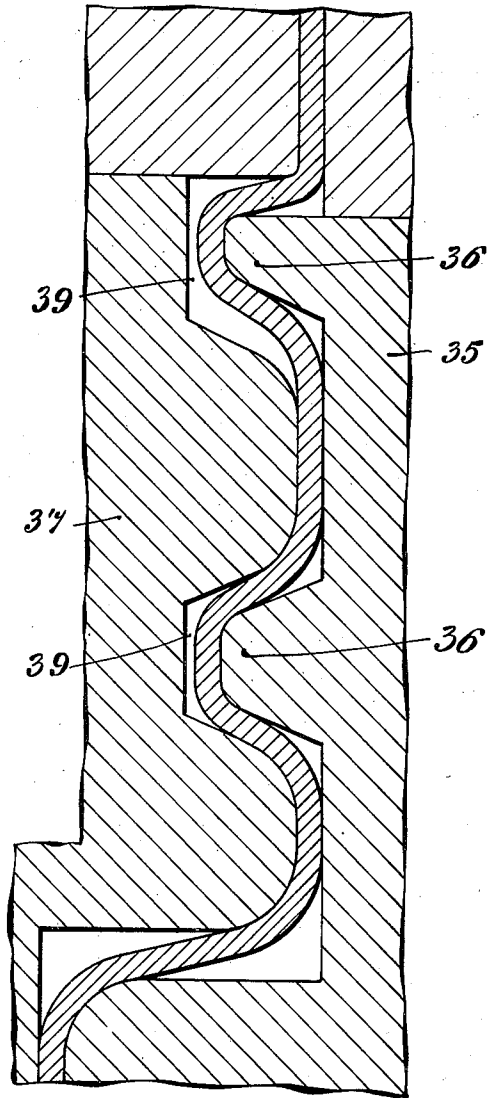


Fig. 11.

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UNITED STATES PATENT OFFICE

2,243,138

DEVICE FOR FORMING SCREW CLOSURE
CAPS AND SIMILAR ARTICLES

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Application April 1, 1938, Serial No. 199,400

7 Claims. (Cl. 153—72)

The present invention relates to a device for forming screw closure caps and similar articles.

Screw closure caps usually are formed by stamping suitable flanged blanks from lacquered sheet metal or the like, and then rolling a thread in the flange or skirt of the blank. The rolling operation preferably is performed by a roller having a threading surface which engages the interior of the skirt of the blank and progressively forces the skirt against a cooperating outer member such as a roller or a stationary section having a threading surface for engaging the exterior of the skirt.

Preferably, the circumferential length of the threading surface of the outer roller or the length of the threading surface of the stationary section is equal to the circumference of the skirt of the cap blank so that a thread of one convolution may be completed when the blank has been rotated once against the outer member. The inner roller has a diameter slightly smaller than the diameter of the cap blank to permit the blank to be placed over and removed from the roller without the necessity of unscrewing the threaded shell from the roller. Consequently, the inner roller has a smaller circumference than the blank and must be rotated more than one complete revolution to form a thread in the skirt having one convolution.

Heretofore, it has been customary to provide both the surface of the inner and outer threading members with a helical threading portion having the same pitch as the pitch of the thread of the container to which the cap was applied. For example, if the pitch of the container thread was .1667 (6 threads per inch) the pitch of the threading portion of both the inner and outer member then also was .1667. However, since the circumference of the inner member was smaller than the effective length of the outer tool, the thread portion of the inner member was inclined at a greater angle than the thread portion of the outer member. Thus, when the inner member was rolled against the outer member, the thread portions did not mate or match. This caused the thread formed in the skirt of the blank to have a pitch and inclination which was different from the pitch and inclination of the thread of the container.

A further difficulty caused by the failure of the inner and outer rolling members to match or mate, was that the resulting cap thread did not extend inwardly sufficiently far to fit properly under the container thread, and hence did not pull the cap downwardly uniformly throughout

its circumference. Due to the difference in the slope of the inner and outer surfaces of the threading tools, the thread, as it approached a full turn, faded in width and inward projection. Actually, the upper end of the thread had only the semblance of a thread and did not engage the container thread to pull the cap downwardly uniformly throughout its circumference.

Attempts have been made to form helical threads having a slope which matches the slope of the container thread. These attempts have not been commercially successful because the machinery required for forming such threads was complicated and expensive or failed to produce satisfactory results.

The present invention aims to overcome the above difficulties and objections by providing an improved device for forming screw closure caps having a helical or spiral thread. The caps produced preferably have a thread of approximately one turn or convolution. The thread projects inwardly to engage the container thread throughout its length and has a slope corresponding to the slope of the container thread. In this manner, the cap thread matches the container thread and is adapted to pull the liner downwardly against the rim uniformly throughout its entire circumference. The invention also aims to improve the cross-sectional shape of the thread and to increase the inward projection without straining the metal or impairing the resiliency thereof. The invention further aims to enable the above improvements to be applied to all types of existing screw closure fabricating machines without complicated or expensive changes.

An object of the present invention is to provide an improved device for forming a screw closure cap having a true helical thread extending about the skirt for at least one revolution.

Another object of the invention is to provide an improved device for making a closure cap with a spiral screw thread having a slope corresponding to the slope of the container.

Another object of the invention is to provide an improved device for making a closure cap having a spiral screw thread substantially uniform in cross-section throughout its entire length.

Another object of the invention is to provide a device for making a closure cap having a spiral thread adapted to engage a spiral thread on a container for at least one complete revolution to pull the liner downwardly uniformly against the rim of the container throughout its circumference.

Another object of the invention is to provide an improved device for forming screw threads in closure caps with minimum strain of the metal and of the lacquer coating thereon.

Another object of the invention is to provide cap forming members which are adapted to be used in connection with existing machines for fabricating screw closures.

Another object of the invention is to apply the principles of the present invention to forming outwardly extending threads on cylindrical or circular boxes, can nozzles and the like.

A further object of the invention is to attain the above advantages without increase in the cost of the articles provided with screw threads and without complicating their manufacture.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein

Fig. 1 is a diagrammatic view illustrating an inner and outer threading member for forming a screw thread in the skirt of a cap blank or the like, the cap blank being illustrated in three different positions during its manufacture;

Fig. 2 is a developed elevational view of the threading surface of the outer member;

Fig. 3 is a developed view illustrating the threading surface of the inner member;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 1 illustrating the thread rib of the outer member in section, and the inner member developed against the rib for one complete revolution and for a partial second revolution;

Fig. 5 is an enlarged sectional view taken along the line 5—5 of Fig. 1, illustrating the formation of the screw thread at the commencement of the threading operation;

Fig. 6 is an enlarged sectional view taken along the line 6—6 of Fig. 1, illustrating the formation of the thread at the completion of the first revolution of the inner threading member;

Fig. 7 is an enlarged sectional view taken along the line 7—7 of Fig. 1, illustrating the formation of the thread at the completion of one complete revolution of the cap blank against the outer threading member;

Fig. 8 is an enlarged fragmentary view illustrating the lower end of the thread of the cap during the partial second revolution of the inner member;

Fig. 9 is an enlarged fragmentary sectional view illustrating a preferred cross-sectional shape of the thread and the tools for forming the same;

Fig. 10 is a diagrammatic view illustrating an inner and outer roller for forming the thread; and

Fig. 11 is a sectional view illustrating cooperating inner and outer members for forming an outwardly extending thread on a can nozzle, box or the like.

Referring again to the drawings and more particularly to Figs. 1 to 9, there is shown a curved stationary threading section or outer member 1, having an inclined thread rib 2 for engaging the exterior of the skirt S of a cap blank B, and a roller or inner member 4 having an inclined thread groove 5 adapted to cooperate with the rib

2 to form a spiral thread T. In order to facilitate placing the cap on the roller or removing it therefrom, the roller has a smaller diameter than the minimum internal diameter of the skirt S after the thread has been formed therein. The inner member or roller may be revolved about the outer member or section by any suitable devices, for example by the machine illustrated in the Hammer patent, No. 1,671,990, dated June 5, 1928, owned by the assignee of the present application, and may be rotated axially by a gear 6 meshing with a stationary gear rack 7 (Fig. 5) to progressively force portions of the skirt into the thread groove and the thread rib.

The thread rib 2 of the stationary member is shown in detail in Fig. 2 with the vertical dimensions thereof enlarged five times with respect to the horizontal dimensions to illustrate the invention more clearly. Preferably, the rib is of sufficient length to form a screw thread in the skirt of the cap of about one convolution, and is inclined at substantially the same angle as the thread of the container to which the cap is applied. The rib projects outwardly a sufficient distance to form a screw thread which extends inwardly under the container thread a sufficient distance to pull the cap downwardly when it is screwed on the container. Preferably, the upper portion of the rib is substantially uniform in section throughout its length so that the cap thread formed is adapted to grip the container thread for one convolution and hold the cap downwardly uniformly throughout its entire circumference. In order to enhance the appearance of the thread, the upper end of the rib 2 is bevelled or tapered at 10, but may be rounded if desired. The lower portion of the rib is cut away horizontally at 11 and is flared or tapered slightly at 12 to facilitate engagement of the upper end of the container thread. The lower end 2a of the rib projects inwardly abruptly with respect to the roller to form the lower end of the thread of the cap abruptly thereon to prevent the end of the cap thread from wedging against the upper end of the container thread in applying the cap thereto.

The outer member may be on a roller or a stationary curved threading section. As shown in Fig. 1, where a stationary section is utilized, the length of the surface is equal to the circumference of a roller having the same diameter as the blank B for making the closure cap. If the thread rib 2 were on a roller, its inclination would be expressed in terms of pitch

$$\left(\text{pitch} = \frac{1}{\text{threads per inch}} \right)$$

However, since the length of the stationary curved threading section corresponds to the circumferential length of a roller, the inclination of the rib for purposes of illustration, may be expressed in terms of pitch. In other words, the "pitch" of the section is expressed as pitch of a roller with a circumference equal to the length of the section. Hence, hereafter and throughout the description and claims, when the thread rib 2 is referred to in terms of pitch or threads per inch, it is to be understood that it is meant that the thread rib corresponds to a thread rib on a roller having a circumference equal to the length of the stationary section.

The thread groove 5 of the roller 4 is shown in detail in Fig. 3, with the vertical dimensions enlarged five times with respect to the horizontal dimensions for clearness. The circumferential length of the groove is substantially equal to the

length of the rib 2, but since the circumference of the roller is shorter than the length of the outer member or section, the thread groove has a portion 5b at its upper end which overlaps the lower portion 5a. The combined length of the portion of the groove extending once around the roller and the overlapping portion 5b is substantially equal to the length of the rib (Fig. 4).

To form a thread in the skirt of the cap having the same length as the rib, the roller must be rotated one complete revolution and a partial second revolution. In Fig. 4, a development of the roller is shown in elevation during its first revolution and in dot-dash lines during its second revolution, with the overlapping portion 5b of the groove mating with the upper portion 2b of the rib.

For example, if a point "X" on the roller, representing the circumferential position of the lower end of the groove, and a point "Y" on the cap blank are adjacent at the commencement of the threading operation (position I, Fig. 1), the point "X" will have been moved circumferentially in advance of the point "Y" approximately one-fifth of a revolution at the completion of one revolution of the blank (position III, Fig. 1). Hence, when the threading operation nears its completion, the lower end of the thread formed at the commencement of the threading operation is not in mating relation with the lower end of the thread groove, but instead is adjacent a portion of the groove spaced in advance of the lower end of the groove.

In order for the rib and thread groove to mate throughout the threading operation to form a thread corresponding to the slope of the rib and of the container thread, the thread groove is inclined at the same angle as the thread rib. In other words, when the roller is developed against the outer members, the rib in the outer member mates with the groove in the roller throughout its entire length (Fig. 4). In this manner, the upper side of the cap thread assumes the true shape or helix of the rib and corresponds to the helix of the container thread.

To provide the thread groove with the same inclination or slope as the thread rib, the pitch of the groove 5, contrary to customary practice, is not equal to the pitch of the thread rib of the outer member. Instead, the pitch of the groove is smaller than the pitch of the rib of the outer tool. For example, the pitch of the rib on a tool for making a cap having a diameter of 38 millimeters would be .1667 (six threads per inch), while the pitch of the groove of the inner member would be .1532 (6.528 threads per inch). By utilizing the above pitches, the groove, in spite of the smaller diameter of the roller, is adapted to accurately mate with the thread rib for more than one revolution of the roller (Fig. 4) and thereby form a thread in the cap with the engaging or upper side having the same slope as the container thread.

Another advantage of providing the roller or inner member and the section or outer member with thread portions having different pitches, is that the diameter of the roller or inner member may be smaller than the cap without affecting the accuracy of the thread slope on the cap. For example, the thread of a 33 millimeter cap, having a diameter of about 1.5 inches, may be formed by a roller having a diameter of about 1.3 inches. These dimensions afford sufficient clearance between the cap blank and roller to permit the blank to be readily placed over and

stripped from the roller with ample clearance and without any danger of being jammed thereon.

In order to prevent the portion of the groove adjacent the lower end thereof from interfering with or distorting the lower end of the thread, slightly before termination of the first and during the partial second revolution of the roller, the groove at its lower end is enlarged to receive the previously formed lower end of the thread (Figs. 7 and 8). Preferably, this is done by cutting away a portion of the roller adjacent the groove to the root of the thread groove to form a recess 15 indicated by cross-hatching in Figs. 3 and 4. The narrow width of the lower end of the cap thread formed by the rib portion 11 further facilitates entry of the cap thread into the recess 15. It is to be noted that the recess or cutaway portion extends along the thread groove for a greater distance than the overlap 5b of the groove 5 on the roller. The reason for this is that contact between the cap thread and the roller groove is not a point contact. The thread on the cap extends into the groove of the roller for a substantial arcuate distance, depending upon the diameter of the cap and roller. For example, if the cap and roller were of the same diameter, the engagement would be about the entire circumference, but such a size of roller is not practical because the finished cap would have to be unscrewed from it. As the size of the roller decreases with respect to the size of the cap, the arc of the contact or inter-engagement between the cap thread and roller groove decreases in length.

The recess 15, in addition to its other functions, facilitates entry of the lower end 2a of the thread rib into the groove at the commencement of the threading operation to form a thread having a blunt start of sudden inward projection, which is impressed deeply enough to make the lower end of the cap thread of full depth and fully effective upon the threads of the container.

In addition to a groove and rib for forming a thread in the skirt of the blank, the inner and outer members may have cooperating portions 16 and 17 (Figs. 5, 6 and 7) for forming suitable knurls or corrugations K at the upper part of the skirt. These knurls prevent slippage between the cap blank and the inner or outer members during the formation of the thread and facilitate manual engagement of the cap to remove it from a container. Preferably, the cap also has a hollow bead or wire edge E (Figs. 5 to 8) at the lower edge of the skirt. The bead may be formed before or during the threading operation, by a member 18 connected to the outer member and having a beading groove 19 therein, and by a member 20 associated with the inner member having a surface 21 for urging a flange of the skirt into the beading groove. Preferably, the member 20 also has substantially horizontal surfaces 22 forming the bottom of the lower end 5a of the threading groove. In order to rotate the inner roller 4 with respect to the outer member or section 1, in predetermined relation, the inner roller has a gear 6 meshing with a gear member 7, such as a gear rack, on the outer member or section 1 (Fig. 5).

A detailed view of a preferred cross-sectional shape of the thread and the threading rib is shown more particularly in Fig. 9. The rib 2 may have outwardly sloping side walls 25 inclined toward each other and may have a slight-

ly rounded crest or top 26 adapted to force the skirt of the blank into the groove. The groove 5 has rounded side walls 27 which are spaced apart to provide a groove slightly wider than the rib at the side walls 25. The bottom 28 of the groove is wider than the crest 26 of the rib, and is set inwardly a slightly greater distance than the rib extends into the groove so that the crest of the thread is spaced out of contact with the bottom of the groove. In order to maintain the portions of the skirt above and below the rib and groove cylindrical, the inner and outer members have cylindrical surfaces 29 adjacent the rib and groove.

Since the rib and groove are in mating relation throughout the formation of the thread, there is no wedging action tending to distort the cross-sectional shape of the thread. As a result, the crest 26 forces the skirt inwardly while the side walls 27 of the groove shape the side walls of the thread. The skirt is out of contact with the bottom of the groove and the side walls of the rib so that the metal "floats" between the tools during the formation of the thread. This "floating" action decreases the strains on the metal and permits the thread to be forced further inwardly with minimum strain on the metal and without marring the lacquer coating of the metal. By keeping the skirt portions adjacent the thread cylindrical, portions other than the cap thread do not engage the container thread. This construction also improves the appearance of the cap.

A preferred means of forming the thread and the operation of the preferred embodiment of the apparatus is illustrated more particularly in Figs. 1, 5, 6 and 7, wherein the formation of the thread is shown in cross-section at various stages during the rotation of the inner member and the blank B in corresponding positions with respect to the outer member. The operation generally comprises placing a skirted blank B on the inner member or roller 4, moving the roller against an outer member such as a stationary section or an outer roller, and rotating the inner roller with respect to the outer member to cause the groove and rib 2 of the inner and outer members to form a thread in the skirt of the blank.

At the commencement of the threading operation, as shown at position I, in Fig. 1, and in Fig. 5, the lower end 2a of the rib 2 cooperates with the lower end 5a of the groove 5 and the horizontal surface 22 forming the bottom of the groove to form the lower end of the thread. The cylindrical portions 29 of roller and outer member maintain the skirt of the blank cylindrical while the upper end or overlapping portion 5b of the groove fits against the upper end of the skirt but does not alter the shape thereof.

As the roller rotates in the direction indicated by the arrow R (Fig. 1) and moves from left to right with respect to the section indicated by the arrow L, the thread is progressively formed in the blank. At the completion of one revolution of the roller (position II, Fig. 1 and Fig. 6) the upper portion 2b of the rib commences to mate with the overlapping portion 5b of the groove while the lower end 5a of the groove fits against the lower cylindrical part of the skirt without altering the shape thereof.

Upon further rotation of the roller (position III, in Fig. 1), the upper ends 2b and 5b of the rib and groove respectively, mate and form the upper part of the thread (Figs. 4 and 7). At this point, the previously formed lower end of

the thread is adjacent a portion of the groove in advance of the lower end thereof. However, the lower end of the thread is not distorted or engaged by portions of the groove because it fits into the recess 15 (Figs. 3, 7 and 8) which is wider and deeper than the thread portion. It is to be noted that the pitch of the cap thread is different from the pitch of the roller, that is, the space between the overlapping ends of the thread in the cap is greater than the distance between the overlapping ends of the roller groove. Hence, the recess 15 in the roller serves to widen the groove in the roller to give sufficient space to accommodate the lower end of the cap thread. Without the recess 15, the previously formed lower end of the cap thread would be deformed (see Fig. 8 for relation of parts).

During the threading operation, the knurling portions 16 and 17 form the knurls K while the wiring or beading members 18 and 20 form the beaded edge E. If desired, the blanks may be subjected to a second threading operation to increase the inward extension of the thread, as illustrated in the patent to John C. Gibbs, No. 2,010,228, granted August 6, 1935, owned by the assignee of the present invention.

The present invention is also applicable to a machine utilizing an inner and outer roller instead of the inner roller and outer section described above, for forming the thread in the skirt of the cap. For example, in Fig. 10, there is shown an inner roller 4 having a thread groove 5 therein corresponding to groove shown in Fig. 3, and an outer roller 30 having a thread rib 2 thereon corresponding to the rib shown in Fig. 2. The rollers 4 and 30 rotate as indicated by the arrows so that the groove and rib cooperate to form the thread in the same manner, as described in connection with the roller and stationary section. The outer roller preferably has a diameter twice as large as the diameter of the inner roller and the thread rib thereon extends slightly more than one-half of its circumference. The other portion of its circumference is smooth and cylindrical and will not interfere with the completed thread formed in the cap as the two rollers begin to separate from each other at the termination of the rolling of the thread in the cap. This makes it possible to strip the cap off the inner roller and to apply a new blank to repeat the process.

In Fig. 11 a device embodying the present invention is illustrated for forming an outwardly extending thread on a can nozzle, box, container or other cylindrical member. The essential difference between this device and the preferred embodiment is that the outer member has a groove instead of a rib and the inner member has a rib instead of a groove. Described more particularly, the device comprises an inner member or roller 35 having a thread rib 36 and an outer member such as a roller or stationary section 37 having a thread groove 39. The rib and groove embody the features of the rib and groove described in connection with the devices for forming an inwardly extending thread and cooperate to form a thread having a true helix adapted to mate with the thread of a cap formed by the devices illustrated in Figs. 1 to 10. By reason of the improved cross-sectional shape of the groove and rib, the thread extends outwardly sufficiently to enable the cap thread to extend under it and get a good grip thereon.

It will be seen that the present invention provides a simple, inexpensive apparatus for mak-

ing an improved screw closure cap. The thread of the cap matches or mates with the container thread throughout approximately one convolution to pull the sealing liner of the cap against the rim throughout its entire circumference. The thread is more attractive in appearance and extends further inwardly to grip the container thread securely. The metal of the skirt is not strained during its formation and the lacquered coating of the cap is not marred by the threading members. The narrow lower end of the cap thread permits a full convolution of the thread about the cap with a uniform accurate slope and without lengthening the skirt of the cap. To lengthen the skirt of the cap requires a change in standardized glass finishes and the construction of new molds by glass factories. The upper side of the cap thread is the effective part in application, and is not affected by changing the position of the lower side of the cap thread to make the thread more narrow. The threading members are adapted to be used in connection with existing cap threading machines, either of the type shown in Fig. 1 or of the type shown in Fig. 10 to accomplish the above advantages. The threading members are readily made, are rugged in construction, and can withstand any rough usage to which they may be subjected.

As various changes may be made in the form, construction and arrangement of the parts herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

Having thus described our invention, we claim:

1. In a device of the class described, the combination of a member adapted to engage the outer side of the skirt of a blank, a circular second member having a maximum diameter smaller than the inner diameter of the skirt of the blank to engage the inner side of the skirt, one of said members having a thread projection and the other of said members having a thread groove, said thread projection and thread groove being inclined at the same angle to cooperate with each other in forming a thread on the blank, the difference in width between the thread projection and the thread groove at one end thereof being increased substantially to permit a partial second revolution of said second member and to eliminate interference between the blank thread and said groove during the partial second revolution of the second member necessary to form a thread in the skirt of the blank of greater length than the circumference of the second member.

2. In a device of the class described, the combination of a member adapted to engage the outer side of the skirt of a blank, a circular second member having a maximum diameter smaller than the inner diameter of the skirt of the blank to engage the inner side of the skirt, said first member having a thread groove therein and said second member having a thread projection thereon, said thread projection and thread groove being inclined at the same angle to cooperate with each other in forming a thread on the blank, the difference in width between the thread projection and the thread groove at one end thereof being increased substantially to permit a partial second revolution of said second member and to eliminate interference between the blank thread and said groove during the partial second revolution of the second member necessary to form a thread in the skirt of the

blank of greater length than the circumference of the second member.

3. In a device of the class described, the combination of an outer roller having an inclined rib for engaging the exterior of the skirt of a circular blank to form a spiral thread therein, and an inner roller adapted to engage the interior of the skirt having a smaller diameter than the blank, said inner roller having a groove therein of the same slope but of a smaller pitch than said rib whereby said groove and rib mate while said rollers are rotated with respect to each other, the width of the groove at one end thereof being increased substantially to eliminate interference with the thread formed in the blank.

4. In a device of the class described, a combination of an outer member having an inclined rib for engaging the exterior of the skirt of a circular blank to form a spiral thread therein, an inner roller having a diameter smaller than the diameter of the circular blank adapted to engage the interior of the skirt, said inner roller having a groove of the same slope as the rib on said first member and extending more than 360 degrees about the roller whereby said groove and rib mate while said roller is rotated with respect to said member, the width of the rib at one end thereof being decreased substantially to reduce the width of the thread formed in the blank at one end thereof to eliminate interference between said end of the thread formed in the blank and the roller during the second partial revolution of said roller in forming a thread extending entirely about the circular blank.

5. In a device of the class described, the combination of a member having a rib for engaging the exterior of the circular skirt of a blank, and a circular member having a diameter smaller than the diameter of the skirt of the blank for engaging the interior of the skirt and having a groove therein, said rib and groove being inclined at the same angle and being adapted to cooperate to form a spiral thread in the skirt of approximately one convolution, said circular member having a recess at one side of the groove adjacent one end of the groove formed therein adapted to facilitate rotation of said roller for more than one revolution with respect to the blank so that a portion of the thread formed in the blank during the first revolution of the roller is adapted to extend into the recess and will not be distorted at the commencement of and during the second revolution of the roller.

6. In a device of the class described, the combination of a member having an inclined threading rib for engaging the exterior of the circular skirt of a cap blank to form a spiral thread therein, and a roller having a smaller diameter than the diameter of the skirt of the blank for engaging the interior of the skirt and having an inclined threading groove therein extending more than 360 degrees thereabout, and a recess adjacent the front end of said groove adding to the width of said groove and adapted to facilitate said roller being rotated more than one revolution with respect to said blank so that the end of the thread first formed in the blank is adapted to extend into the recess during the second revolution of the roller.

7. In a device of the class described, the combination of a member having an inclined thread rib for engaging the exterior of the circular skirt of a cap blank to form a spiral thread therein, and a circular roller for engaging the interior of the skirt having a diameter smaller than the

diameter of the skirt of the blank and having an inclined thread groove therein extending for more than 360 degrees thereabout and a recess adjacent and below the end of the groove which in cooperation with the thread rib forms the end of the cap thread furthest from the cover of the cap, said recess extending substantially to

the root of the thread groove to permit a partial second revolution of said groove member without deforming the end of the blank thread first formed and without slippage between the blank and said groove member.

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