July 6, 1948. C. HAMMER 2,444,506

METHOD OF MAKING CONTAINER CLOSURES

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Fig. 1.

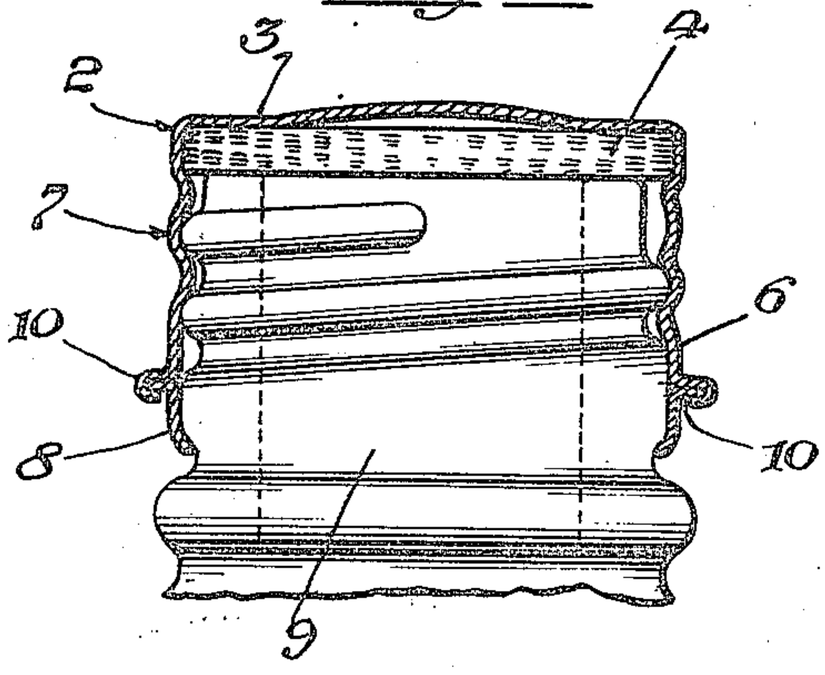


Fig. 2.

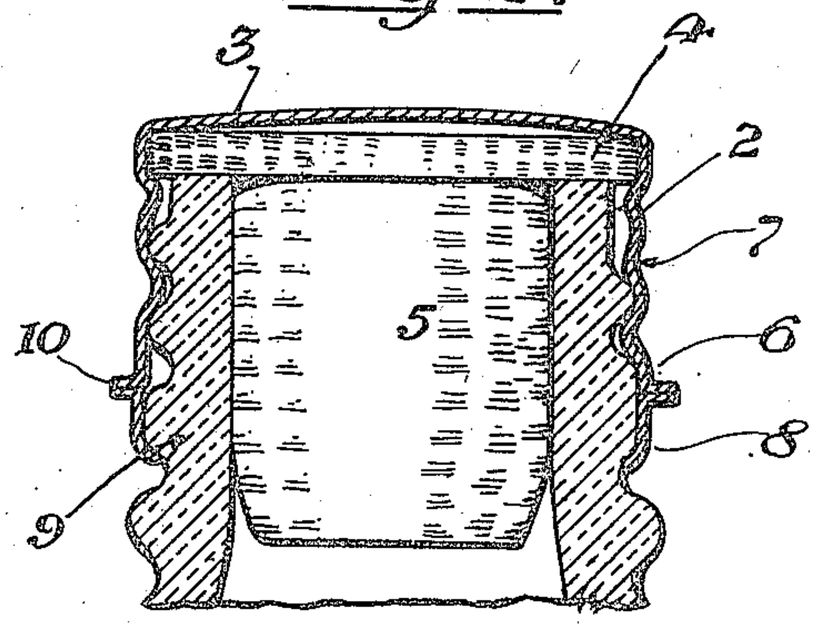


Fig. 3.

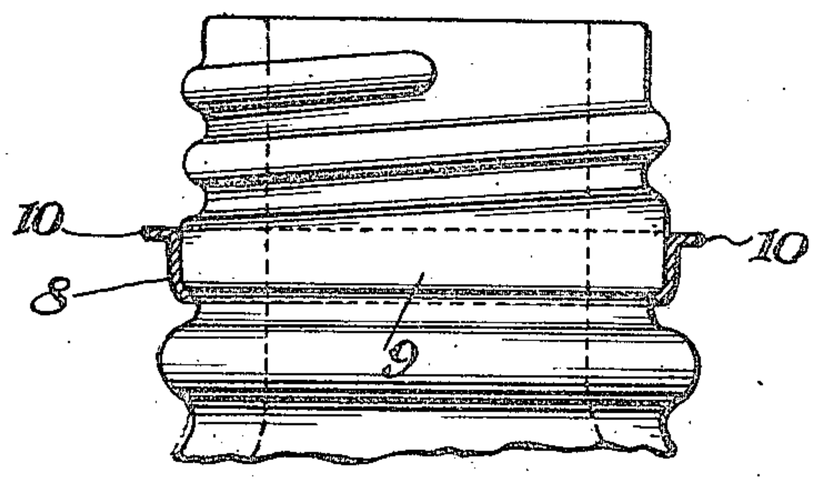


Fig. 4.

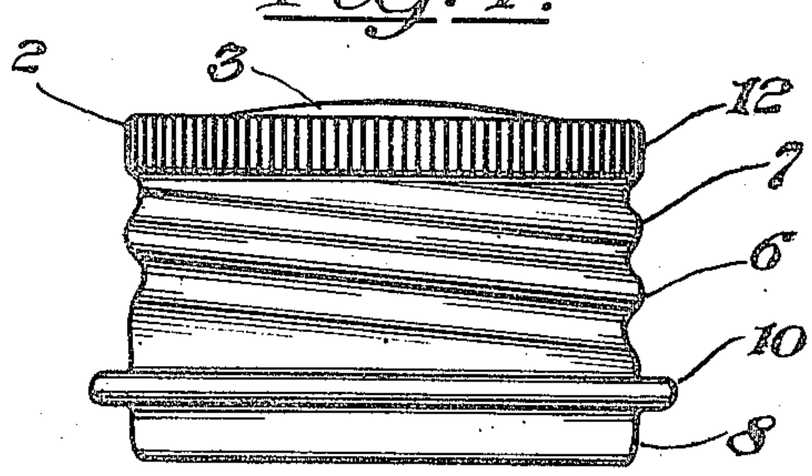


Fig. 5.

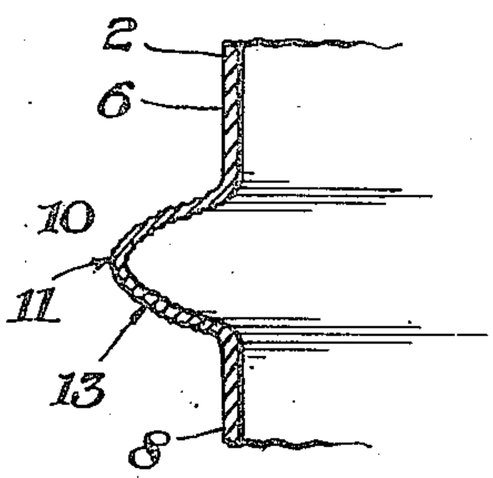


Fig. 6.

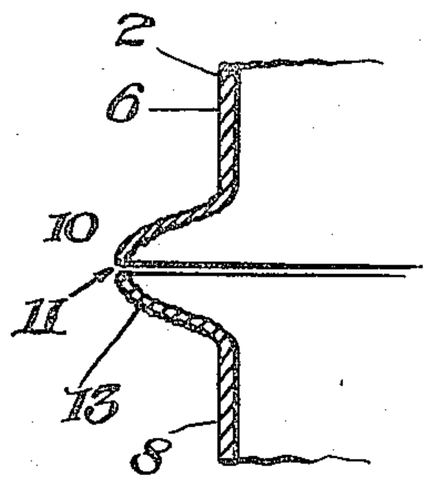
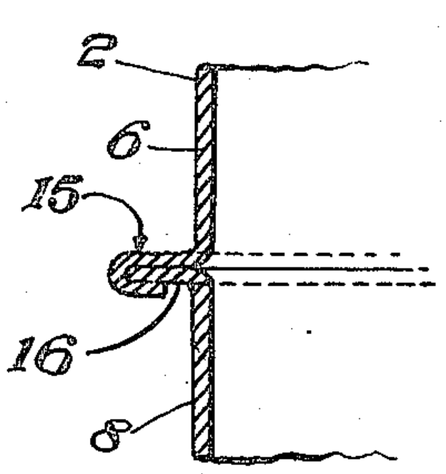


Fig. 7.



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July 6, 1948. C. HAMMER 2,444,506

METHOD OF MAKING CONTAINER CLOSURES

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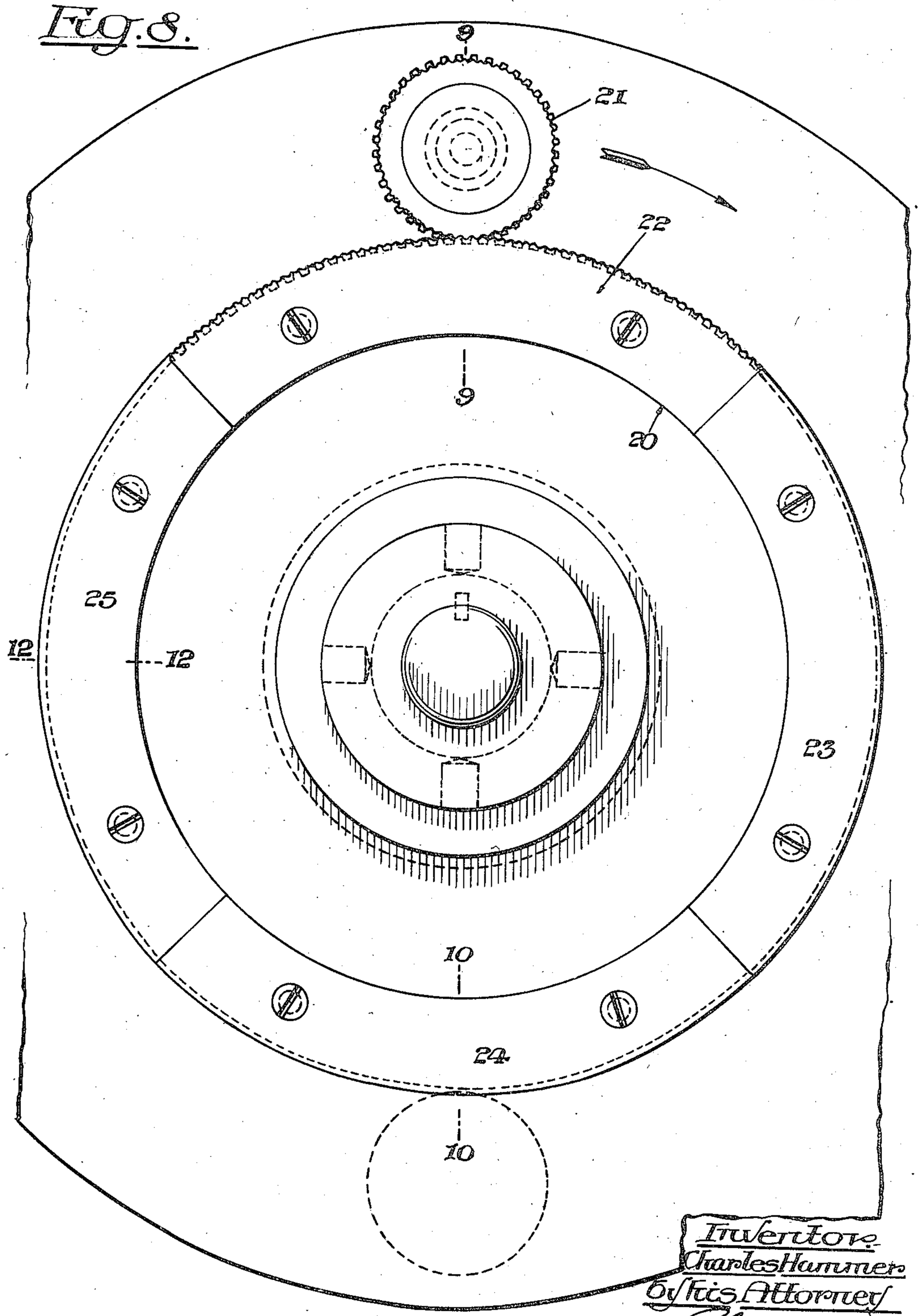
Fig. 8.



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METHOD OF MAKING CONTAINER CLOSURES

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Fig. 9.

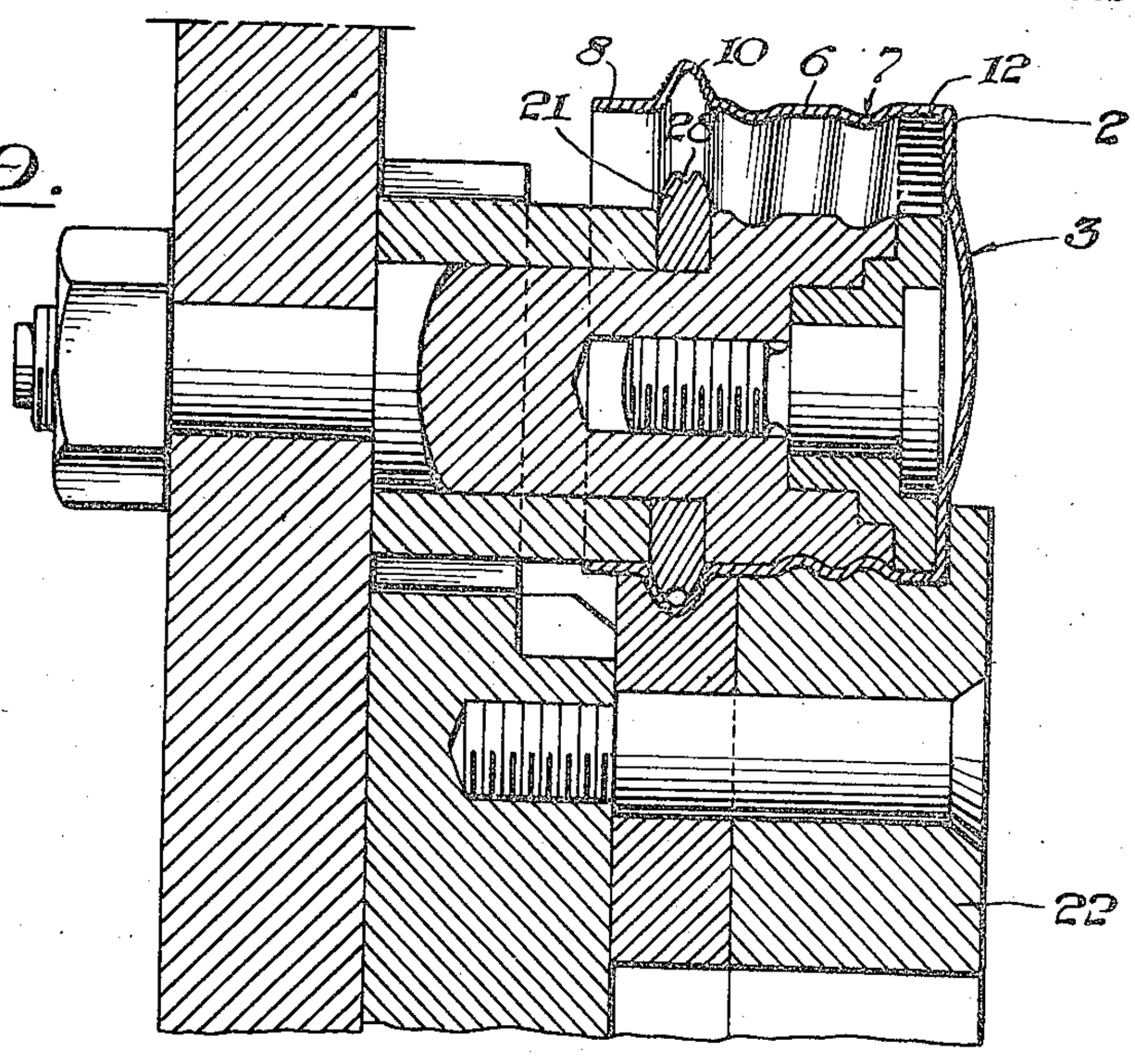
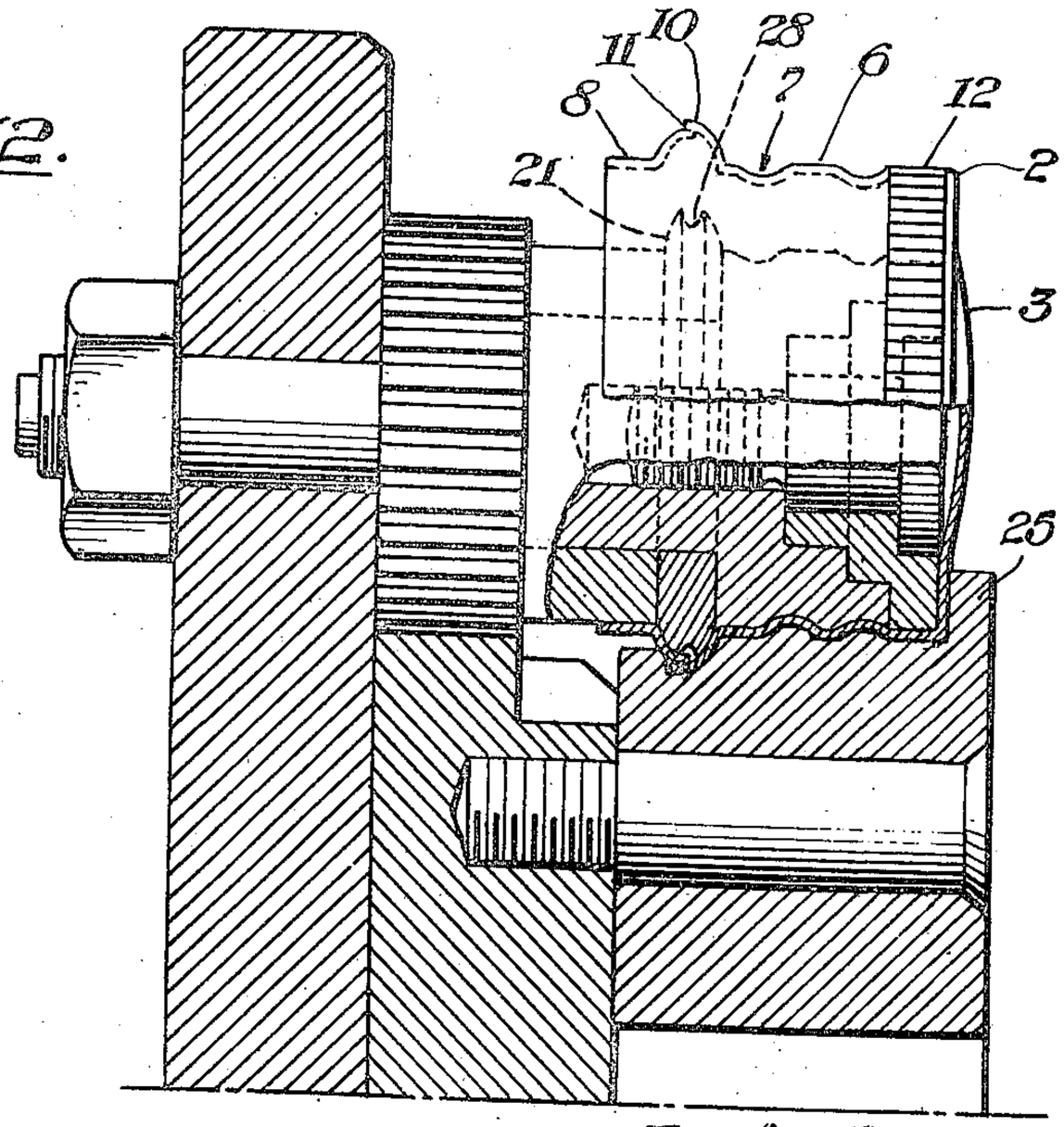


Fig. 12.



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METHOD OF MAKING CONTAINER CLOSURES

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Fig. 10.

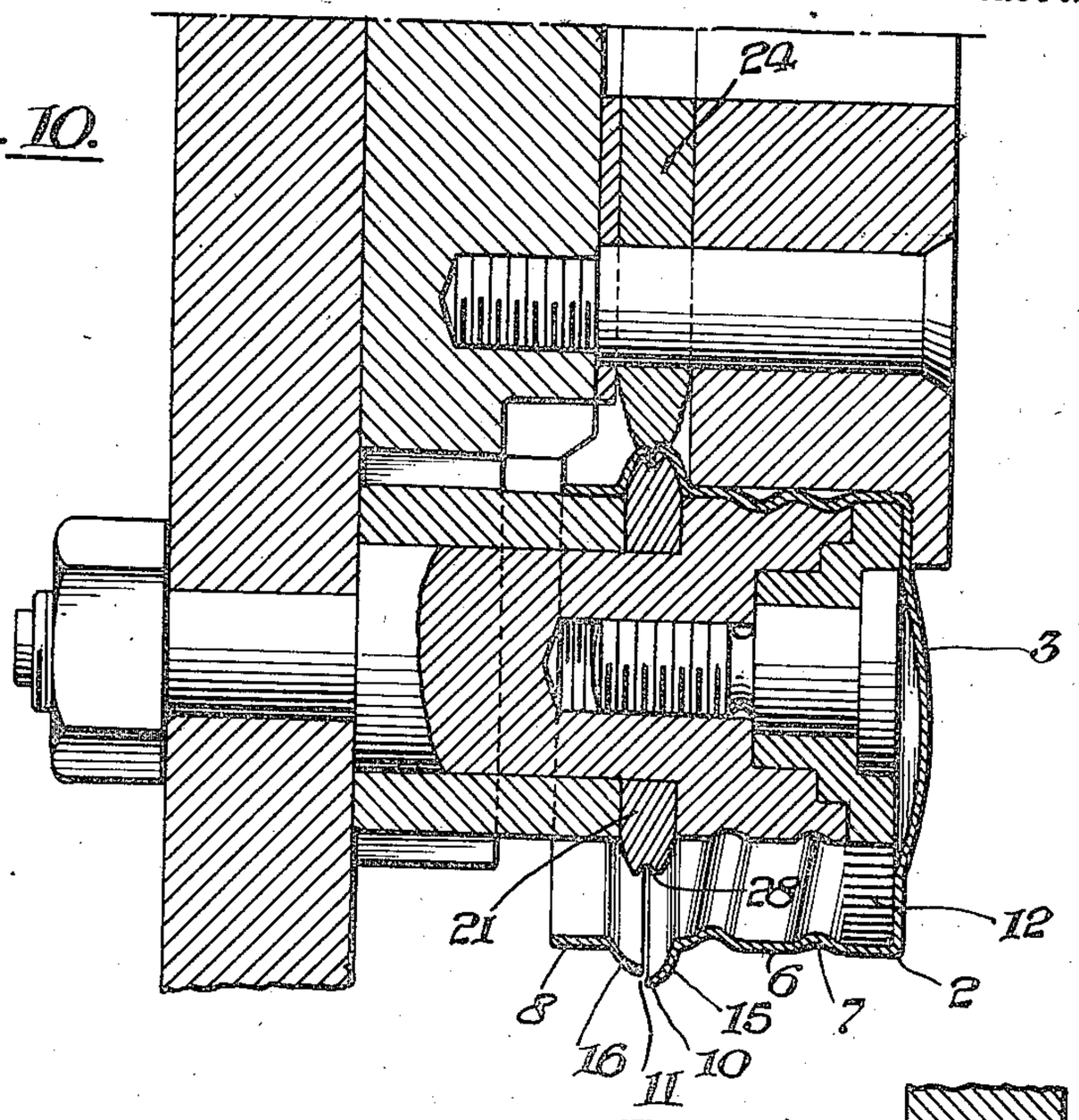


Fig. 11.

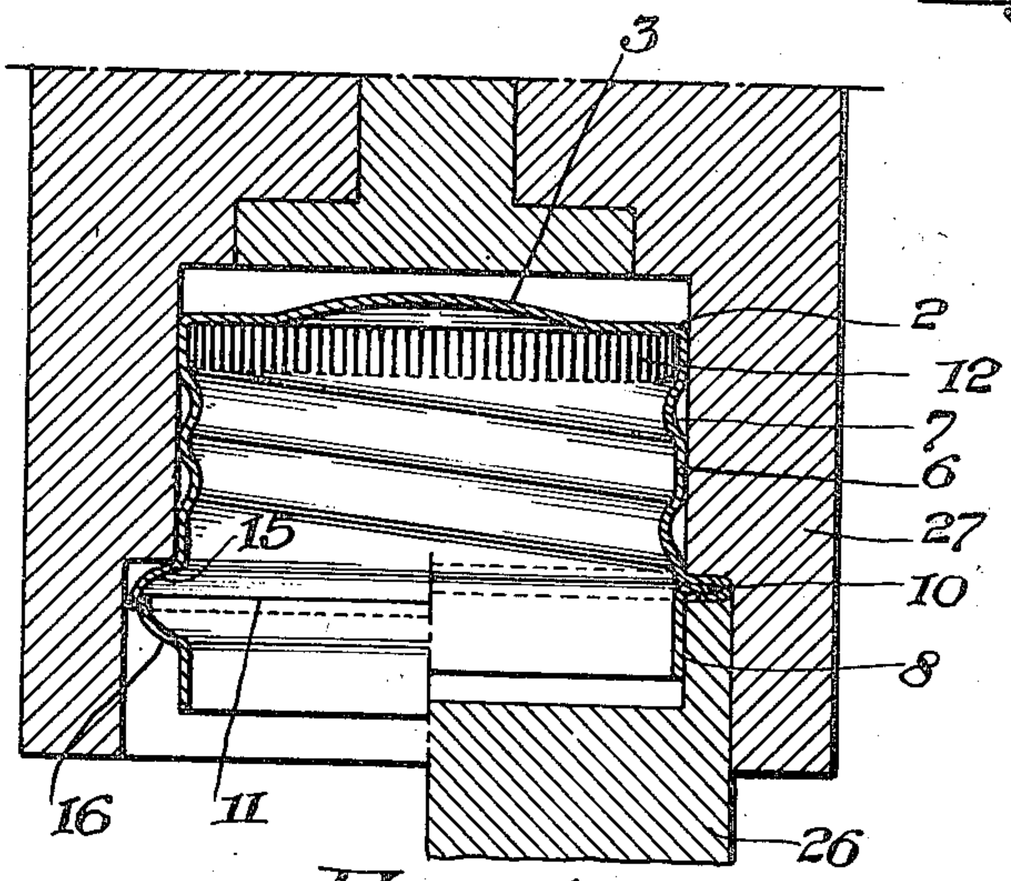
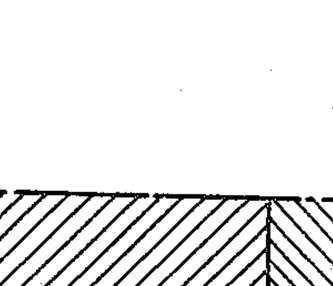
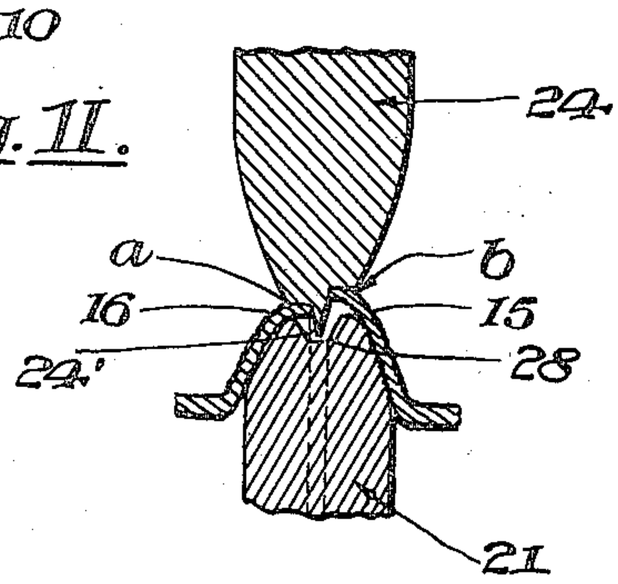


Fig. 13.





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Patented July 6, 1948

2,444,506

UNITED STATES PATENT OFFICE

2,444,506

METHOD OF MAKING CONTAINER CLOSURES

Charles Hammer, Garden City, N. Y.

Application March 21, 1942, Serial No. 435,597

6 Claims. (Cl. 113—121)

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This invention relates to caps or closures for containers or receptacles such as bottles and jars and to the method of making the same, it more particularly relating to what are known as reseal or tamper-proof closures, by which is meant that style of closure which will readily disclose improper tampering with the container contents, the present invention having to do with that form of closure shown and described in my prior Patents 2,175,350 of October 10, 1939, and 2,191,989 of February 27, 1940.

The object of the present invention is the provision of an improved pre-formed, preferably rotatable reseal cap comprising the cap or closure proper which may be used to reseal the container and a sealing band of the same material effective to prevent improper tampering with the container contents, both made in a continuous operation and of the same material such as tin or black plate or some suitable springy material, whereby the cost of making and assembling these resealable caps is very materially reduced and whereby also the cap and its sealing band may be more readily separated without the necessity of first removing the sealing band and when separated will clearly indicate any improper tampering with the contents and which cap may be quickly and inexpensively produced without the use of objectionable scoring, score lines or tear-off strips or the use of such thin material that the cap is practically not reuseable.

In the manufacture of this style of caps, efforts have been made to accomplish the desired result either by scoring the cap so as to enable one part of the cap to be torn from the other along the score lines or by providing tear-off strips or a sealing band of a thinner fragile metal than that of which the cap is made.

The trade has recognized that score lines are objectionable for numerous reasons, among which is that the cap will not always tear, or will tear unequally and cannot be readily reused.

Tear-off strips are also objectionable since, frequently, it is difficult to sever the strip along a predetermined line resulting in but a portion of the band being removed and requiring the application of tools to remove the cap. Also, it is not infrequent that manipulation of such strips results in injuries to the hands of the user which have sometimes proven serious. Consequently, customers have taken a strong dislike to such type of caps.

The use of sealing bands of different material than the cap itself, such as thin aluminum or tin foil, is not only more expensive since it is

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necessary that the band and cap be made or assembled by separate operations materially increasing the cost of manufacture of the cap but such thin sealing bands have the same objectionable features as tear-off strips.

In attempts to obviate these disadvantages, caps have been made of some thin pliable fragile metal which will permit the cap to be pressed or molded on to the container neck to conform to the shape thereof, that is, caps of pliable metal in which the locking elements such as threads are formed when the cap is applied to the container but these, obviously, are also objectionable since they are easily bent out of shape on the removal of the cap and, therefore, become inefficient to reseal the container, as distinguished from a preformed metal cap, that is, one in which the metal is sufficiently rigid, as when formed of tin or black plate, to permit the cap with its locking elements or threads to be formed on a machine and applied to the container without the necessity of shaping or molding it thereon which also requires time and is expensive, and in which its reuse to preserve the contents of the container, due to its light and flimsy character, is materially interfered with.

Therefore, it is the object of the present improvement to provide a severable cap which is not dependent upon score lines, tear-off strips or thin bands of foil or independent assembly steps, or the application of tools to insure removal.

Therefore, the principal object of the invention is the provision of an improved preformed cap that is, one in which the cap may be efficiently and inexpensively made by machinery and shipped in quantities for quick and easy application to containers without the shaping or molding of the threads while on the container and which may be made in a continuous operation and all of the same material and which will permit the cap to be removed without first mutilating or removing the sealing band.

In the drawings accompanying and forming a part of this specification—

Fig. 1 illustrates in section this improved cap applied to the neck of a container such as a bottle.

Fig. 2 is a sectional view of a modification of the cap and sealing band flange.

Fig. 3 illustrates the upper portion of a container with the cap removed and the sealing band on the bottle.

Fig. 4 is a side view of the completed cap and its band.

Figs. 5, 6 and 7 illustrate, respectively, in sec-

tion the formation of the milled flange, the severed flange and the union of the flanges by bending one over the other.

Fig. 8 is a plan view of one form of rolling elements that may be used to form the cap.

Fig. 9 is a sectional view on line 9—9 of Fig. 8 and illustrates the formation of the corrugated or knurled portion, the threads and the milled projecting flange.

Fig. 10 is a sectional view on line 10—10 of Fig. 8 and illustrates the severing of the flanges and the partial bending thereof.

Fig. 11 is a detail sectional view illustrating the flange severing elements.

Fig. 12 is a sectional view on line 12—12 of Fig. 8 and illustrates the lapping of the flanges, and

Fig. 13 is a sectional view showing the compression of the flanges of the cap into juxtaposition.

Similar reference characters indicate corresponding parts in the several views.

Before explaining in detail the present improvement and its mode of operation, I desire it understood that the invention is not limited to the details of construction and arrangement of parts illustrated in the accompanying drawings since the invention is capable of other embodiments, and that the phraseology employed is for the purpose of description and not of limitation.

In the preferred form of cap herein shown, it is illustrated as a skirt-formed, threaded cap although, obviously, it could be made with any suitable locking elements as desired and the improvement may be used with various styles and sizes of caps for different kinds of containers. In the present instance, the cap is shown as a bottle cap 2 comprising a top 3 which may be provided with a sealing medium such as a liner 4 or cork 5 for stoppering the container when in the form of a bottle, and a skirt or capsule 6 having locking elements such as threads 7 formed thereon.

Below these locking elements, the cap has formed therewith a sealing band 8 which may be readily bent or spun around a shoulder 9 of the container neck to prevent the cap as a whole being removed therefrom, thereby permanently securing the lower part of the cap to the bottle, this bending, of course, taking place after the cap has been completely rotated on to the container.

The juxtaposed portions of the cap 2 and sealing band 8 are shaped to form an outwardly extending hollow or double-wall bead, projection or flange 10 either of continuous or interrupted annular form extending beyond the normal plane of the cap and its band, and this annular flange is, during the manufacture of the cap, severed at its apex 11 and subsequently united by any suitable means as by bending or clamping one part of the flange over the other or by a suitable adhesive such as solder, and this forms a weakened portion to permit the cap to be separated from its sealing band.

In the manufacture of this improved cap, a cup shaped blank is first made comprising a top and its depending skirt or capsule of sufficient length to enclose the neck of the container and also form the sealing band. Then, by means of suitable dies or rolling elements, the skirt may be provided on its exterior at its upper end with knurls or corrugations 12 to provide an efficient grip for rotating the cap on the bottle and preferably at the same time the skirt is also provided with threads 7 if desired or other suitable locking means. During the formation of these threads, the outwardly extending flange 10 is also formed, usually substantially V-shaped and, preferably, during the formation of this V-shaped flange, the metal thereof is weakened by milling it as at 13.

This milling operation, of course, may take place before the cap skirt is otherwise treated, if desired, but is preferably accomplished simultaneously with the formation of the outwardly projecting flange by providing the flange forming elements with milled surfaces. This milling thins and, therefore, weakens the metal at the apex portions of the projecting flange so that when the cap is rotated or forced off the container, it is readily separated from its sealing band and, consequently, the cap can be readily replaced to reseal the container. Subsequent to the formation of this milled flange 10, the flange is severed along or adjacent to its apex 11.

In one form of the improvement, after the projecting flange is severed at its apex, the adjacent flange portions are brought into engagement by suitable pressure (see Fig. 2) and united by an adhesive medium such as solder or other material, the milled portions of the flange providing a roughened surface facilitating this procedure. This may be readily done in various ways as by rotating the cap while on its roll through a bath of molten solder.

In another form of the improvement, the outer edge of one flange portion is bent, clamped or rolled over the other flange portion, thus obviating the use of a soldering material (see Fig. 1). Both, however, form a readily separable joint for the removal of the cap portion.

To accomplish the bending or rolling of one portion of the flange 10 over another portion thereof, as for instance, the top portion 15 over the bottom portion 16 of the flange, it is merely necessary during the formation of the cap and as the flange is being severed along its apex, to exert sufficient pressure upon the severed flange portions of the sealing band so as to force the bottom flange portion 16 inwardly, thus shortening it, whereby the top flange portion 15 will project sufficiently to overlap it. Thereafter, the flanges may be pressed together and completely lapped. When this overlapping connection of the flanges is used, the cap is more easily removed from the container because the cap can be rotated backward without rotating the sealing band and, consequently, the cap, in riding up the threads when it is turned off the container, exerts most of its pull on the weakened flange portion rather than on the lower spun-over edge. Thus, the sealing band, with its lower edge spun and, therefore, clamped around the shoulder 9 of the container, has a tendency to retain its position on the container and not rotate with the cap so that the cap, on being turned off the container, rotates relative to the sealing band and very much facilitates severance of the cap from the sealing band since the cap can ride up on the threads of the container without pulling the sealing band with it so that the weakened flanges are more quickly and readily severed, and this also without any distortion or mutilation of the sealing band and making it dangerous subsequently to handle the container.

Instead of completely severing the flange, it may be severed at intervals therearound which will sufficiently weaken it to permit the separation of the cap and this would, of course, make it unnecessary to reunite the cap members.

In practice, while either flange portion may overlap or be bent over the other flange, I have shown the top flange portion 15 of the cap bent or rolled over the lower or flange portion 16 of the sealing band.

One form of elements that may be used for carrying out this method is shown in Figs. 8 to 12 comprising a fixed circular element 20 and a roll or rolling element 21 which carries the cap around the fixed element and which is shaped to correspond with the fixed element. These elements are provided with meshing teeth properly to position them.

The fixed element 20 is made up of segments or sections of any desired number depending upon the number of forming steps required, four being shown. The segmental sections 22 and 23 are so shaped as to form the corrugations 12, the threads 7 or other locking means and during the formation of these threads form the flange 10 and mill it. Another segmental section, as 24, severs the flange and partly bends the severed portions thereof in readiness to be completely lapped when this step is preferred to soldering. Subsequent to this, the so-bent flanges are, by the section 25, initially lapped to form a closed flange in readiness to be further treated as by suitable male and female dies 26 and 27 in the manner shown in Fig. 13 so that the walls of the flanges are compressed into substantial juxtaposition, as illustrated in Fig. 7. This step rather sharply bends the milled apex of the lapping flange and has a tendency consequently further to weaken it. Usually means is provided to give different radial pressures to the segmental sections whereby one may be shifted relative to another, as required, and for which purpose the ends of the segmental sections have a sliding fit and overlap one another.

When the flange is to be severed from the outside in, the segmental section 24 is provided with a cutting portion 24' (see Fig. 11) which may be formed separate therefrom and, therefore, removable to facilitate resharpening, cooperating with a groove or depression 28 at the apex of the roll 21 and into which the cutting edge will project.

The cutting member is so formed, as by providing suitable shoulders *a* and *b* that they will press the under flange 16 inwardly and then somewhat press the top flange 15 toward it in readiness for the next step of lapping the flanges, which takes place as the cap is carried by its roll to the segmental section 25 where the flanges are lapped and again closed. The cap may then be placed in the dies 26 and 27 (Fig. 13) and the flanges compressed into substantial juxtaposition (see Fig. 7).

Thus, when the cap is rolled over its proper segment, the flange will be severed adjacent to its apex and then these severed flanges will be brought into juxtaposition to be united as by solder or by suitable pressure so brought into position to have one flange rolled over the other.

When the flanges are to be merely brought into juxtaposition, as in Fig. 2, without other bending, the segment 25 and its roll 21 are shaped to accomplish this.

Thus, from the foregoing, it will be seen that both the cap and its sealing band may be made in practically a continuous operation and of the same material and yet have a weakened separable joint which will readily permit the cap to be removed independently of its sealing band and, thereafter, to be used to reseal the container.

In practice, the severing of the flange may either be from the inside out or the outside in by merely reversing the structure of the rolling elements. In the present instance, I have shown the cap severed from the outside in.

Thus, the several sections of the fixed segmental element, together with the roll carrying the cap, moving around these segmental sections, performs each a part of the work and make the cap and its sealing band practically in one continuous operation and all of the same material in readiness to be applied to a container and have the sealing band 8 bent under the container shoulder with the juxtaposed portions of the cap and sealing band flange 10 sufficiently weakened to permit the cap to be rotated free of the sealing band when the container is to be opened and yet permit the cap to be used to reseal the container.

In practice, the milled portion of the flange may also be scored to weaken it further which likewise can be done during the operation of forming the cap simply by providing the necessary scoring face on the forming elements. Also, in that form where one flange portion is seamed or rolled over the other, it may be desirable only to mill the overlapping portion 15 of the flange instead of the entire flange and this, of course, may be done merely by milling the corresponding coacting faces of the cap roll and segment.

If desired, the locking threads, when such are used, may be relatively shallow in the first instance and subsequently deepened in the manner shown and described in my patents hereinbefore referred to, thus giving a truer and better thread.

In the present improvement it will therefore be seen that the gradual rotation of the cap off the container will result, due to the inclination of the threads, in separating the cap portion from the sealing band portion at the apex of the flange, this being obtained without the tearing-off of a tear-off strip, the fracture thereof crosswise or the use of any instrument to sever the parts and since the cap and its sealing band cannot thereafter be reunited in any practical way, it follows that any improper tampering with the container can be readily detected both by the hand and the eye, however, without interfering with the replacement of the cap to reseal the container.

Thus, I have provided a preformed severable cap and sealing band which can be made in practically one continuous operation out of the same material and which will efficiently prevent tampering with the contents without detection and in which the cap portion can be readily removed without first removing or tearing off a sealing band.

It is to be understood that, by describing in detail herein any particular form, structure or arrangement, it is not intended to limit the invention beyond the terms of the several claims or the requirements of the prior art.

Having thus explained the nature of my said invention and described a way of constructing and using the same although without attempting to set forth all of the forms in which it may be made or all of the modes of its use, I claim:

1. The method of making a closure cap capable of repeated reuse and having locking elements for rotatably securing the cap on to a container and a sealing band severable therefrom and adapted to be bent around the shoulder of a container, which consists in providing the cap with a skirt of sufficient length to receive

the locking elements and also form an integral sealing band below said locking elements, forming said locking elements in the skirt, forming below said locking elements an outwardly extending double-walled integral flange, then severing the flange adjacent to its apex, and then reuniting the severed parts of the flange to form a severable joint weaker than the original joint of the unsevered parts and permit the cap to be separated from its sealing band on the rotation of the cap off the container without first fracturing or removing the sealing band.

2. The method of making a closure cap capable of repeated reuse and having locking elements for rotatably securing the cap on to a container and a sealing band severable therefrom and adapted to be bent around the shoulder of a container, which consists in providing the cap with a skirt of sufficient length to receive the locking elements and also form an integral sealing band spaced below said locking elements, forming inclined or threadlike locking elements in the skirt, forming in the spaced part below said locking elements an outwardly extending double-walled integral flange, then severing the flange adjacent to its apex, and then reuniting the severed parts of the flange to form a severable joint that will permit the cap during its rotation off the container up the inclined locking elements to rotate relatively to its band and effect its release therefrom and be removed without first fracturing or removing the sealing band.

3. The method of making a closure cap capable of repeated reuse and having locking elements for rotatably securing the cap on to a container and a sealing band severable therefrom and adapted to be bent around the shoulder of a container, which consists in providing the cap with a skirt of sufficient length to receive the locking elements and also form an integral sealing band below said locking elements, forming said locking elements in the skirt, forming below said locking elements an outwardly extending double-walled integral flange having a weakened portion, then severing the flange adjacent to its apex, and then reuniting the severed parts of the flange to form a severable joint weaker than the original joint of the unsevered parts and permit the cap to be separated from its sealing band on the rotation of the cap off the container without first fracturing or removing the sealing band.

4. The method of making a closure cap capable of repeated reuse and having locking elements for rotatably securing the cap on to a container and a sealing band severable therefrom and adapted to be bent around the shoulder of a container, which consists in providing the cap with a skirt of sufficient length to receive the locking elements and also form an integral sealing band below said locking elements, forming said locking elements in the skirt, forming below said locking elements an outwardly extending double-walled integral flange, then severing the flange adjacent to its apex, and then reuniting the severed parts of the flange by bending one over the other to form a severable joint weaker than the original joint of the unsevered parts and permit the cap to be separated from its sealing band on the rotation of the cap off the container without first fracturing or removing the sealing band.

5. The method of making a closure cap capable of repeated reuse and having locking elements for rotatably securing the cap on to a container and a sealing band severable therefrom and adapted to be bent around the shoulder of a container, which consists in providing the cap with a skirt of sufficient length to receive the locking elements and also form an integral sealing band below said locking elements, forming said locking elements in the skirt, forming below said locking elements an outwardly extending double-walled integral flange, then severing the flange adjacent to its apex, and then reuniting the severed parts of the flange by bending that of the cap over that of the sealing band to form a severable joint weaker than the original joint of the unsevered parts and permit the cap to be separated from its sealing band on the rotation of the cap off the container without first fracturing or removing the sealing band.

6. The method of making a closure cap capable of repeated reuse and having locking elements for rotatably securing the cap on to a container and a sealing band severable therefrom and adapted to be bent around the shoulder of a container, which consists in providing the cap with a skirt of sufficient length to receive the locking elements and also form an integral sealing band below said locking elements, forming said locking elements in the skirt, forming below said locking elements an outwardly extending double-walled integral flange, then severing the flange adjacent to its apex, and then reuniting the severed parts of the flange by bending one to a greater extent than the other and over the other to form a severable joint weaker than the original joint of the unsevered parts and permit the cap to be separated from its sealing band on the rotation of the cap off the container without first fracturing or removing the sealing band.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
161,634	Patterson	Apr. 6, 1875
982,070	Johnson	Jan. 17, 1911
1,043,359	Revel, Jr.	Nov. 5, 1912
1,272,859	Russell	July 16, 1918
1,319,395	Huddleston	Oct. 21, 1919
2,002,456	Sebell	May 21, 1935
2,191,989	Hammer	Feb. 27, 1940
2,028,202	Gauthier	Jan. 21, 1936
2,089,972	Lyon	Aug. 17, 1937
2,153,344	Selliken	Apr. 4, 1939
2,175,350	Hammer	Oct. 10, 1939
2,280,724	Sharp	Apr. 21, 1942