

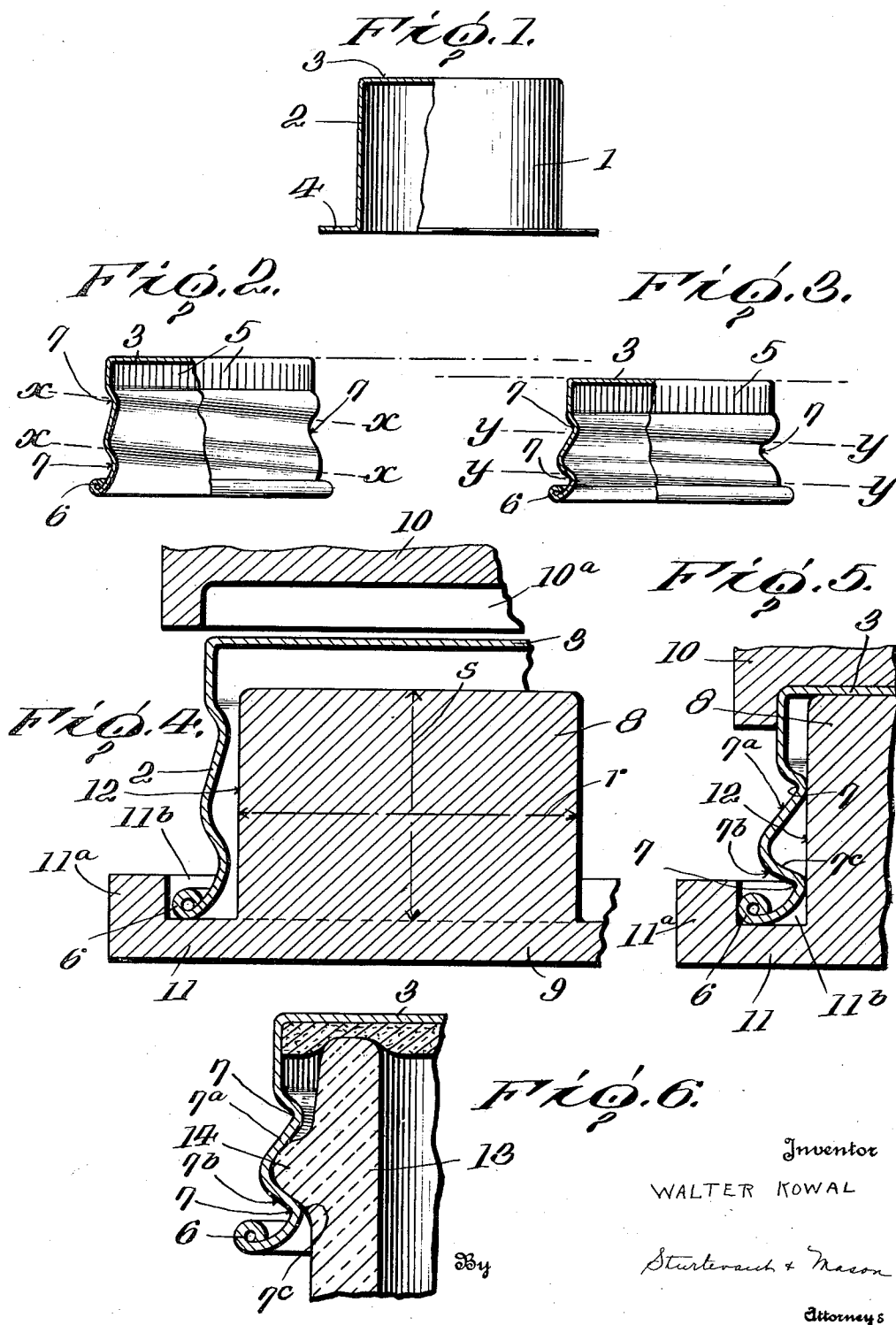
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METHOD OF FORMING THREADED CAPS FOR CONTAINERS

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METHOD OF FORMING THREADED CAPS FOR CONTAINERS

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The invention relates to new and useful improvements in a method of making screw caps for containers, and more particularly to a screw cap which is made from metal having the surface thereof decorated.

An object of the invention is to provide a method of forming the thread or threads in the screw cap whereby said threads may be made of the desired depth to properly engage the holding threads on the neck of the container without injuring or marring the decorated surface of the cap or rupturing the metal of the cap itself.

The invention consists in the forming of a hat-shaped blank from a sheet of metal by drawing, then by the aid of rolling dies forming a shallow thread depression in the vertical wall of said blank, and finally subjecting the blank to pressure in a direction endwise of the vertical wall for bending the metal in said thread depression to complete the formation of the thread. The lower edge of the blank is preferably curled.

In the drawings:—
Figure 1 is a view partly in side elevation and partly in section showing a hat-shaped blank from which the screw cap is produced.

Fig. 2 is a similar view showing the blank after it has been subjected to the rolling dies for forming a shallow thread depression in the vertical wall thereof, and also after the lower edge of the blank has been curled.

Fig. 3 is a similar view of a completed cap.

Fig. 4 is a view showing the means for supporting the blank and for pressing the same with the blank in place and prior to the applying of pressure thereto.

Fig. 5 is a similar view, but showing the pressure applied and the thread completed.

Fig. 6 is an enlarged sectional view through a portion of a finished cap and a portion of a bottle neck showing the cap applied to the bottle neck.

It is a common expedient to form screw caps from metal for bottles by first forming a hat-shaped blank and then subjecting said blank to the action of rolling dies for curling the edge and rolling a thread in the vertical side wall of the blank. In order to make these threads of sufficient depth to co-

operate with the holding threads on the neck of the bottle, in caps the bending of the metal is so excessive that the rolling dies often break the decorated surface of the metal and sometimes rupture the metal itself. Furthermore, in a very small cap it is difficult to properly form the threads of proposed depth solely by the aid of rolling dies.

The invention is directed to a method of forming a screw-thread metal cap wherein this excessive pressure of the rolling dies is avoided. To this end the metal is first drawn to form a hat-shaped blank in the usual manner, and this hat-shaped blank is subjected to a rolling die pressure for forming a very shallow thread depression in the vertical wall of the blank. The flange is also curled by the aid of rolling dies. This initial formation of the thread depression which is very shallow does not shorten to any material extent the length of the vertical wall, and the pressure necessary to form a shallow thread in the vertical wall even when the cap is very small is not so excessive as to in any way injure the surface of the metal or mar the decorated surface when one is present.

The thread as rolled by the rolling dies is preferably of a greater pitch than the pitch of the thread on the neck of the bottle with which the cap is to be used. The vertical wall of the blank is of greater length than the vertical wall desired in the finished cap. The cap thus formed is placed on an anvil or supporting horn which extends into the cap. This supporting horn is of a diameter equal to the internal diameter of the thread in the completed cap. The height of the horn or anvil is likewise the height of the wall of the finished cap and is, therefore, considerably less in height than the wall of the blank with the shallow thread depression therein. The cap thus formed is placed on this anvil and then pressure is applied thereto for shortening the vertical wall and for bringing the pitch of the thread to the normal desired pitch to cooperate with the pitch of the holding thread on the neck of the bottle.

Referring more in detail to the drawings,

in Fig. 1 the hat-shaped blank is indicated at 1. Said hat-shaped blank includes a vertical wall 2, a top portion 3 and a flange 4. This hat-shaped blank is formed from a sheet of metal by drawing and cutting in the usual manner. The blank is subjected to rolling dies for forming a knurl at the upper end of the cap, curling the lower edge, and for providing a shallow thread depression in the vertical wall 2 of the blank. The curling, knurling, and threading may all be formed in a single operation, or they may be formed in separate operations. The knurl is indicated at 5 in the drawing, the curl at 6, and the shallow thread depressions at 7. It will be noted that the vertical wall 2 of the shallow threaded blank is substantially the same length as the vertical wall 2 of the hat-shaped blank. The formed thread is so shallow that the wall is not shortened to any great extent, but the depressions determine the final thread and crease the metal to such an extent that an endwise pressure on the vertical wall will complete the forming of the thread. The pitch of the thread after the shallow threading operation is indicated by the line $x-x$ in Fig. 2 and this pitch is greater than the pitch of the holding thread on the neck of the bottle with which the cap is to be used. The knurled, curled and threaded blank as shown in Fig. 2 is placed on an anvil or horn 8 carried by a suitable supporting means 9. The diameter of this horn is indicated by the line r , and is slightly less than the inner diameter of the threaded blank as shown in Figs. 2 and 4. The height of the horn indicated by the line s is less than the height of the vertical wall 2 of the shallow threaded blank. After the cap has been placed on this horn or anvil a pressure member 10 is lowered into contact with the top 3 of the blank and pressure is applied, moving this member 10 to the position shown in Fig. 5. This pressure member has a recess 10^a in its under face, which receives the top portion of the cap, and this centers the cap relative to the horn or anvil 8. There is a laterally projecting flange 11 associated with the horn and said flange is provided with a raised portion 11^a forming a recess 11^b which receives the lower curled edge of the blank. Inasmuch as the lower curled edge is resting on the flange and is limited in its outward movement the vertical wall of the blank is submitted to endwise pressure when the member 10 is moved downwardly into engagement with the cap. The metal has been slightly broken down by the shallow threading of the vertical wall and the endwise pressure on the vertical wall will cause the metal to bend along the thread depression. The metal engaging the wall 12 of the horn 8 will be limited so that if the thread at one portion yields more quickly than at an-

other, it will be limited by this horn in its inward movement and the remaining portion of the thread will likewise be forced inward to a similar extent. Furthermore, this horn 8 is made of true circular form and the thread being forced into engagement all the way around will produce a cap which is true and round as well as a thread which is of proper size.

It will be noted that the depression in the vertical wall of the blank is more acute at the bottom of the depression as viewed from the outer face of the cap. Therefore, the endwise pressure on the vertical wall will cause the metal to be bent inward rather than outward and thus it is that the thread is completed and sized by this pressure applied to the end wall of the cap. This submitting of the vertical wall to endwise pressure and the completing of the thread changes the pitch of the thread which is now indicated by the line $y-y$ (Fig. 3) and produces the normal desired pitch of the thread corresponding to the pitch of the holding thread on the neck of the bottle. Inasmuch as one end of the thread terminates adjacent the knurl and the other adjacent the curl, this endwise pressure necessarily changes slightly the pitch of the thread and this is why the pitch is initially formed slightly greater than that desired in the final cap. By this method of forming the completed thread no pressing tool engaging the outer surface of the metal is necessary other than the threading dies which exert only a light pressure against the metal to form the initial shallow thread. Therefore, the surface of the metal is undisturbed and unbroken by the forming tools which form and complete the thread.

In Fig. 6, I have shown on an enlarged scale, the preferred shaping of the thread which can be accomplished by my improved method. In this figure a portion of the bottle neck is indicated at 13. The thread thereon is indicated at 14. The thread on the cap is indicated at 7, 7. The upper depression is where the thread is starting beneath the knurl and the lower depression is the completed effective portion of the thread which holds the cap on the bottle.

It will be noted that the metal between the extreme inner depression in this figure includes a portion 7^a inclined slightly to the vertical and a portion 7^b which is inclined slightly to the horizontal. This provides a gripping portion 7^c which extends well under the thread 14 of the bottle neck and holds the cap firmly on the bottle. When the thread is formed by this applied pressure to the vertical wall, the vertical wall takes the shape shown in detail in Fig. 6. This is due in part to the fact that the metal engages the anvil or horn and when it is limited from movement further in, then fur-

ther pressure will cause an outward bulging of the wall between the thread depression resulting in this horizontal portion 7^b which so effectively engages beneath the thread on the neck of the bottle.

While I have described the cap as being produced from a hat-shaped blank in which shallow threads are formed in the vertical wall by rolling dies, it will be understood that the initial breaking of the metal to form the threads may be formed in other ways. The essential step in the present method consists in the subjecting of the blank having the shallow depression to an endwise pressure for the purpose of bending the metal at the formed depression for completing the thread. While I have referred to the container with which the cap is used as a bottle, it will be understood that the invention may be applied in the construction of caps for use on jars or the like and also on metal containers.

Having fully described my invention what I claim as new and desire to secure by Letters Patent is:—

1. The method of forming metal screw caps for bottles consisting in forming a hat-shaped blank, rolling the vertical wall of said blank to form a shallow thread depression therein, and subjecting said vertical wall to endwise pressure for bending the metal in said depression to complete the formation of the thread.

2. The method of forming metal screw caps for bottles consisting in forming a hat-shaped blank, rolling the vertical wall of said blank to form a shallow thread depression therein, the pitch of the thread thus formed being slightly greater than the desired pitch of the thread on the finished cap, and subjecting said vertical wall to endwise pressure for bending the metal in said depression to complete the formation of a thread of the desired depth and pitch.

3. The method of forming metal screw caps for bottles consisting in forming a hat-shaped blank, rolling the vertical wall of said blank to form a shallow thread depression therein, placing said formed blank on a horn, subjecting the vertical wall of said cap to endwise pressure for bending the metal in said depression to complete the formation of the thread, said horn being so proportioned as to limit the inward bending of the metal for producing a thread depression of a predetermined inner diameter.

In testimony whereof, I affix my signature.

WALTER KOWAL.