July 14, 1925. 1,546,091

B. S. LEWIS

MANUFACTURE OF METAL CAPS AND THE LIKE

Filed June 27, 1921 2 Sheets-Sheet 1

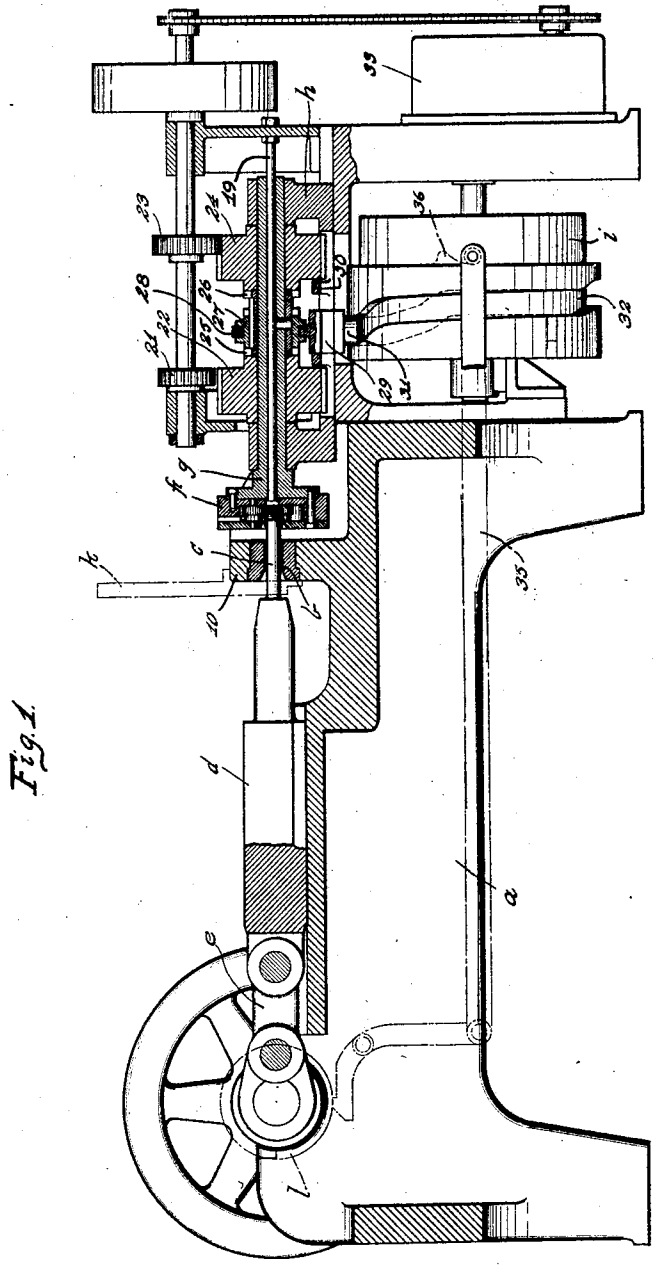


Fig. 1.

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Fig. 3.

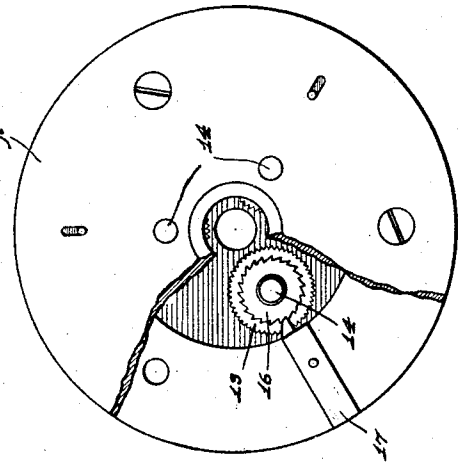
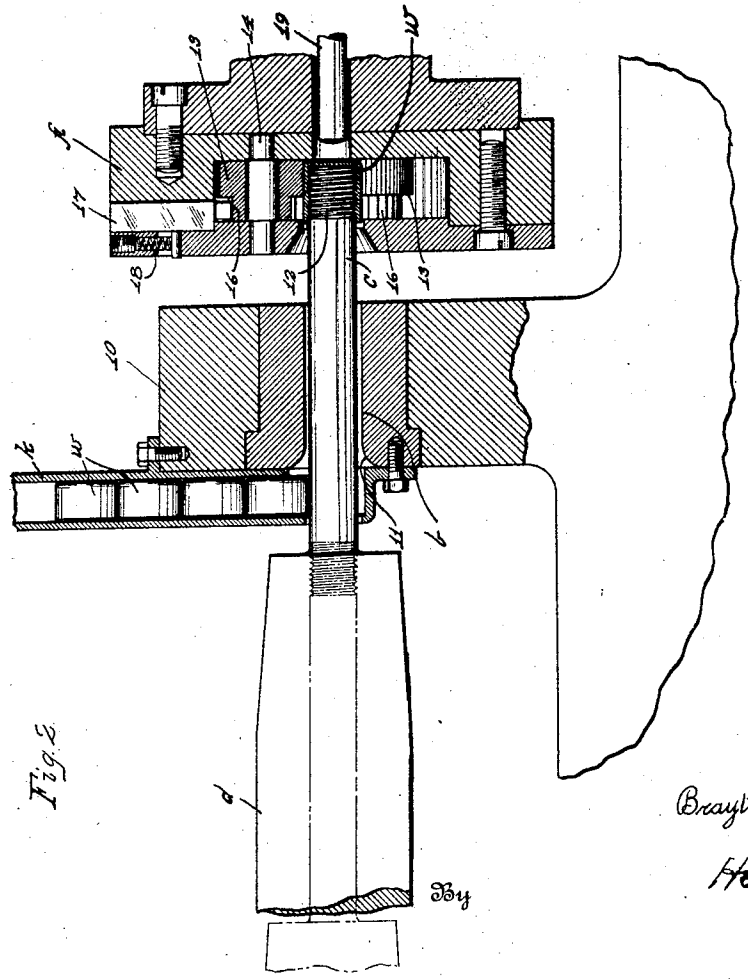


Fig. 2.



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UNITED STATES PATENT OFFICE.

BRAYTON S. LEWIS, OF NEW BRITAIN, CONNECTICUT, ASSIGNOR TO THE STANLEY WORKS, OF NEW BRITAIN, CONNECTICUT, A CORPORATION OF CONNECTICUT.

MANUFACTURE OF METAL CAPS AND THE LIKE.

Application filed June 27, 1921. Serial No. 480,544.

To all whom it may concern:

Be it known that I, BRAYTON S. LEWIS, a citizen of the United States, and a resident of New Britain, county of Hartford, State of Connecticut, have invented certain new and useful Improvements in the Manufacture of Metal Caps and the like, of which the following is a specification.

The aim of the present invention is to provide an improved method and a new and advantageous machine for expeditiously and economically shaping, threading and knurling articles, such as caps for grease cups.

Broadly considered, my invention contemplates forming or shaping a cap and simultaneously internally threading the same by means of a threaded plunger or male die and a reducing die, externally knurling the cap while it is on the male die, and then unscrewing the cap from the die, preferably by means of the knurling tools, which, at the same time, are backed or slid off of the cap.

In the accompanying drawings, I have shown one embodiment which the machine of the present invention may take, but it is to be clearly understood that this disclosure is for the purpose of illustration only as the invention is susceptible of other modifications, and that the terms used are merely terms of description and not in any sense terms of limitation.

In these drawings:—

Fig. 1 is a side view of the entire machine, in vertical longitudinal section.

Fig. 2 is an enlarged view showing, in section, the dies and the knurling head, and

Fig. 3 is a forward end view of the knurling head with parts broken away for purposes of illustration.

The general arrangement and organization of the parts of the machine will be readily understood from Fig. 1, wherein *a* is a frame or base from the intermediate portion of which arises a web or standard 10 in which is mounted a female or reducing die *b* with which cooperates a male die *c* carried by a ram *d* mounted for reciprocation in suitable guide-ways on the base *a* and actuated by a crank *e*. To the other or rear side of the reducing die *b* is a knurling head *f* carried by a spindle *g* mounted in suitable bearings in a carriage *h*, the movement of which is controlled by a cam *i*. *k* is a magazine for feeding the cap blanks or shells *w* one by one to a position in front of the reducing die *b*.

The present invention resides more particularly in the arrangement and construction of the parts shown in Fig. 2. Referring particularly to this figure, it will be seen that the reducing die *b* has a flaring throat or mouth 11. The male die *c* is in the form of a cylindrical rod having its forward end threaded as at 12. The knurling head *f* carries a plurality, in the present instance three, concentrically positioned knurlers 13 in the form of longitudinally corrugated rollers and these knurlers are rotatably mounted upon suitable studs 14. Fixed to each roller 13 is a ratchet 16 with which cooperates a spring pressed pawl 17, the arrangement being such that when the head *f* is rotated in one direction, the rollers 13 and their associated ratchets 16 are free to rotate on their own axes, but when the rotation of the head is reversed, the pawls lock the ratchets and knurlers against rotation on their own axes. In the present instance, the pawls 17 are mounted for radial sliding movement and are normally urged inwardly by springs 18.

In operation, when the ram *d* is moved into the withdrawn or retracted position shown by dotted lines, Fig. 2, the lowermost shell in the magazine *k* is free to drop into position in front of the reducing die. Upon movement of the male die through the female die, it takes the shell *w* with it causing the same to be drawn out to final shape, and in this drawing operation, the metal of the shell will be caused to flow into the grooves of the thread 12 so that the internal periphery of the cap is given a thread complementary to the thread 12. The male die *c* with the drawn cap thereon comes to rest in the position shown in full lines, Figs. 1 and 2, and then the knurling head is moved forwardly to the position shown and is rotated in the same direction as that in which the thread 12 runs, and in which direction the knurlers are free to turn on their own axes so that they have a rolling contact with the cap and thereby knurl the same. After the knurling operation is completed, the knurlers are maintained in engagement with the cap and the knurling head is rotated in the opposite direction, whereupon the pawls 17 become effective to

lock the knurlers against rotation on their own axes. During this reverse rotation of the knurling head the cap is unscrewed from the male die and this unscrewing operation is facilitated due to the fact that the knurling of the cap slightly increases the internal diameter thereof thereby loosening the cap from the male die. In unscrewing the cap, the thread thereon is chased or smoothed up by the thread on the male die. During the unscrewing of the cap from the male die, the knurling head is backed away from the male die at a rate of movement slightly greater than at which the cap is unscrewed, so that at the time the cap has been entirely unscrewed, the knurlers are gripping the cap at its closed end, and thus crushing of the cap by the knurlers is prevented. The ram *d*, carrying the male die, is now withdrawn and then immediately advanced and during this cycle of movement of the ram, continued backward movement of the knurling head brings the formed cap into engagement with a stationary rod 19 fixed to the frame of the machine *a* and extending through the spindle *g*, resulting in ejection of the cap from between the knurlers; a new shell drops in front of the reducing die; and this shell is forced through the reducing die.

It is, of course, understood that the movements of the plunger or male die and the knurling head may be brought and controlled in any suitable manner. By way of illustration I have shown, in Fig. 1, the knurling head as being driven in a direction to knurl through the gears 21 and gear 22 and in the opposite direction, during which the cap is unscrewed from the male die, through the gears 23, 24. The gears 22, 24 are loose on but non-shiftable with respect to the spindle *g* and on the respective opposed faces of these gears are clutch teeth 25, 26 adapted to be engaged, one at a time, by a clutch member 27 keyed to the spindle *g* and rotatably mounted within a bearing 28 carried by a slide 29. The slide is mounted for reciprocating movement in the carriage *h* and the extent of this movement is limited by the abutments 30. The slide 29 carries a roller 31 which works in the cam groove 32 of the cam *i* and which is driven at a reduced rate of speed through suitable gear mechanism within the gear box 33. It will be understood that the cam groove 32 is of such shape that, (starting with the knurling head in retracted position, and the clutch member 27 in neutral position) it will move the slide 29 to the left, referring to the drawings, thereby engaging the clutch member 27 with the teeth 25 and then the slide and carriage *h* will move forwardly in unison until the knurling head is in the operative position shown in Figs. 1 and 2; the carriage and slide remain at rest in this position until the knurling is completed; then the cam groove 32 moves the slide 29 to the right to engage the clutch member 27 with the teeth 26 whereupon the knurling head is rotated in a direction to unscrew the cap from the male die and during this unscrewing operation the carriage is moved to slowly back off the knurlers from the cap. After the knurling head has been moved to a position where the finished cap has been ejected therefrom by the rod 19, the cam groove 32 will move the slide 29 into neutral position and it will remain in this position until the ram *d* has made another cycle, that is, has been retracted to permit a new shell to drop in front of the reducing die and then advanced to force this shell through the reducing die. For the purpose of properly timing the movement of the male die, the ram *d* is controlled, through a one-revolution clutch *l* and the rod 35, by a cam member 36 on the cam *i*.

I claim as my invention:—

1. The herein described method of manufacture which consists in simultaneously shaping and internally threading an article by drawing a blank over the threaded die and through a reducing die, manipulating the metal of the article to slightly increase the diameter thereof, and then unscrewing the article from the threaded die.

2. The herein described method of manufacture which consists in simultaneously shaping and internally threading an article by drawing a metal blank over the threaded die, circumferentially rolling the metal of the article while on the die, and then unscrewing the article from the die.

3. The herein described method of manufacture which consists in simultaneously shaping and threading an article by drawing a metal blank over a threaded die, and simultaneously knurling and circumferentially rolling the metal of the article while on the die.

4. The herein described method of manufacture which consists in simultaneously shaping and internally threading an article by drawing a metal blank over a threaded die, and knurling the said article while on the die by rolling a manipulating member thereabout.

5. The herein described method of manufacture which consists in simultaneously shaping and internally threading an article by drawing a metal blank over a threaded die, manipulating the metal of said article by a suitable member to slightly increase the internal diameter thereof, and then unscrewing the article from the die by means of said member.

6. The herein described method of manufacture which consists in simultaneously shaping and internally threading an article by drawing a blank over a threaded die,

rolling manipulating members about the circumference of said article while on the die, locking said members against rotation relative to said article, and revolving said members in a direction to unscrew the article from said die.

7. The herein described method of manufacture which consists in simultaneously shaping and internally threading an article by drawing a blank over a threaded die, rolling corrugated members about the circumference of the article while on the die, locking said members against rotation relative to the article, revolving the members in a direction to unscrew the article from the die, and backing the members off of the article while it is being unscrewed from said die.

8. In a machine of the character described, a threaded die and a reducing die, a rotatable head, and knurling rollers mounted in said head for rolling contact with the article shaped on said threaded die.

9. In a machine of the character described, a threaded die, a reducing die, means for moving said threaded die through said reducing die and then maintaining it at rest, a rotatable head in axial alinement with said threaded die, knurling rollers mounted in said head, and means for moving said head into and out of operative position.

10. In a machine of the character described, a threaded die, means for shaping a blank thereon, a member for manipulating the metal of the blank while it is on said die, a device for locking said manipulating member against movement relative to the article, and means for moving said manipulating member in a direction to unscrew the shaped article from said die.

11. In a machine of the character described, a threaded die, and means for shaping a metal blank thereon, means for manipulating the metal of the blank while it is on said die, and means for rotating said manipulating means first in one direction to effect manipulation of the metal and then in the opposite direction to unscrew the shaped article from said die.

12. In a machine of the character described, a threaded die, means for shaping a blank thereon, a rotatable head provided with a plurality of knurling rollers, means for moving said head into and out of operative position, and means for rotating said head in one direction to knurl the shaped article and then in the opposite direction to unscrew the article from said threaded die, said knurling rollers being locked against rotation relative to said head when the latter is rotated in the opposite direction.

13. In a machine of the character described, a threaded die and a cooperating reducing die, a rotatable head, a member rotatably mounted therein for manipulating the metal of a blank shaped on said threaded die, means for rotating said head in one direction to cause said member to manipulate the metal and then in the reverse direction to unscrew the shaped article from said threaded die, and a device for locking said manipulating member against movement relative to the shaped article when said head is rotated in the reverse direction.

14. In a machine of the character described, a threaded die, and cooperating means for shaping a metal blank thereon, means for manipulating the metal of the blank shaped on said die, means for rotating said manipulating means first in one direction to effect the manipulating of the metal of the shaped article and then in the opposite direction to unscrew the article from said die, and means for backing said manipulating means off of the article during the unscrewing operation.

15. In a machine of the character described, a threaded die and cooperating means for shaping a metal blank thereon, a rotary head, a knurling roller mounted therein, means for rotating said head in one direction to knurl the shaped article and then in the opposite direction to unscrew the article from said die, a device for locking said roller against movement relative to the article when said head is rotated in the opposite direction, and means for backing off said roller from the article during the unscrewing operation.

16. In a machine of the character described, a threaded die and cooperating means for shaping a metal blank thereon, a rotary head, a knurling roller mounted therein, means for rotating said head in one direction to knurl the shaped article and then in the opposite direction to unscrew the article from said die, a device for locking said roller against movement relative to the article when said head is rotated in the opposite direction, means for backing off said roller from the article during the unscrewing operation, and means for ejecting the article from said head.

17. In a machine of the character described, a reducing die and a threaded die, means for moving said threaded die through said reducing die and then maintaining it at rest, a rotatable head in axial alinement with said threaded die and provided with knurling rollers, means for moving said head into and out of operative position, means for rotating said head first in one direction to knurl the shaped article and then in the opposite direction to unscrew the article from the threaded die, and means for locking said rollers against rotation relative to said head during the unscrewing operation, said rollers being backed off the article during the unscrewing operation.

18. In a machine of the character de-

scribed, a reducing die and a threaded die, operating means for moving said threaded die through said reducing die, a slidable carriage, a knurling head mounted in suitable bearings in said carriage, a cam for moving said carriage into and out of operative position, means for rotating said head first in one direction to knurl the shaped article and then in the opposite direction to unscrew the article from said threaded die, and means associated with said cam controlling said operating means.

19. In a machine of the character described, a rotary head, a knurling roller mounted therein, and a ratchet mechanism for automatically locking said roller against rotation relative to said head when the latter is rotated in a given direction.

20. In a machine of the character described, a slidable carriage, a knurling head mounted in suitable bearings thereon, means for rotating said head including a reverse clutch, a slide having limited movement on said carriage and connected to the shiftable member of said clutch, and a cam for moving said slide and said carriage.

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