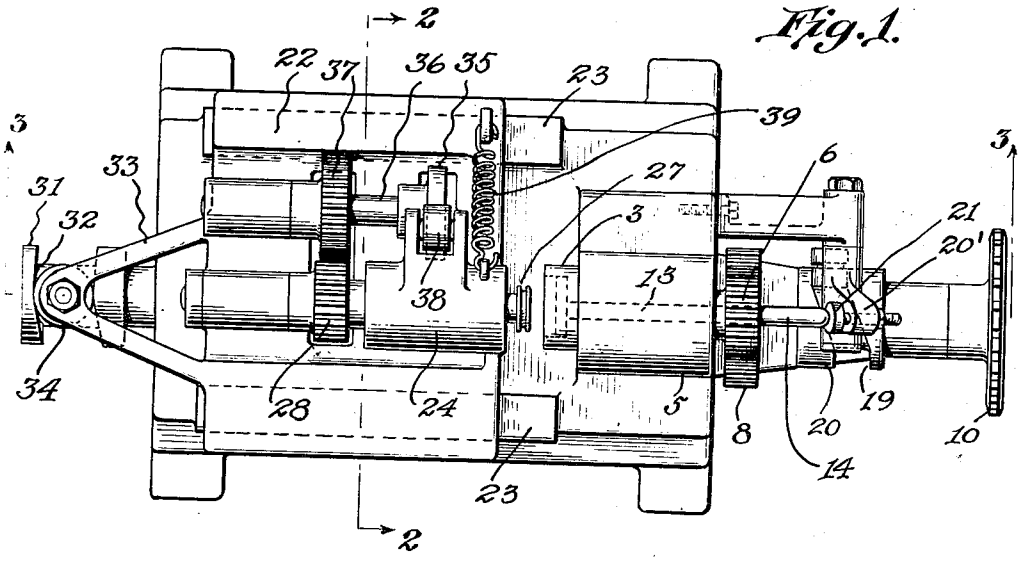
Dec. 23, 1941. J. J. WILLIAMS 2,267,005

APPARATUS FOR FORMING METAL CLOSURES

Filed Sept. 16, 1937 2 Sheets-Sheet 1

Fig. 1.



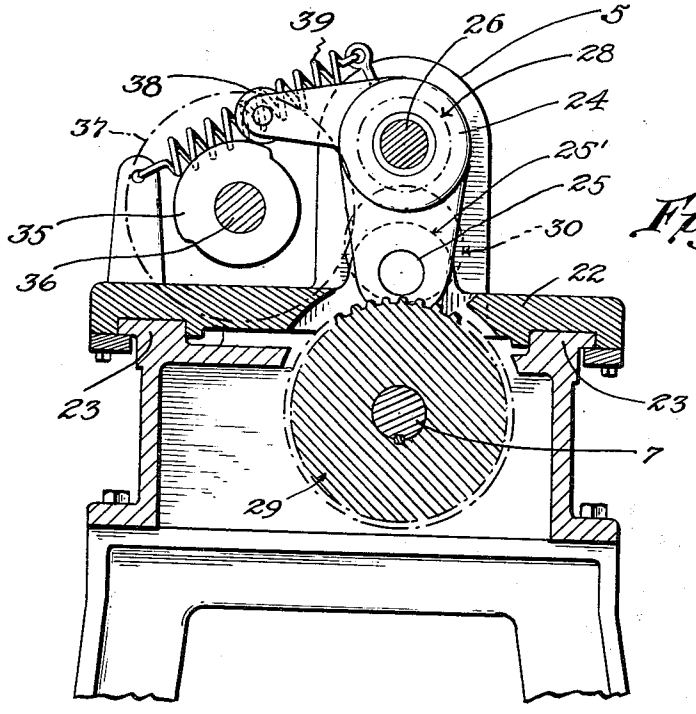


Fig. 2.

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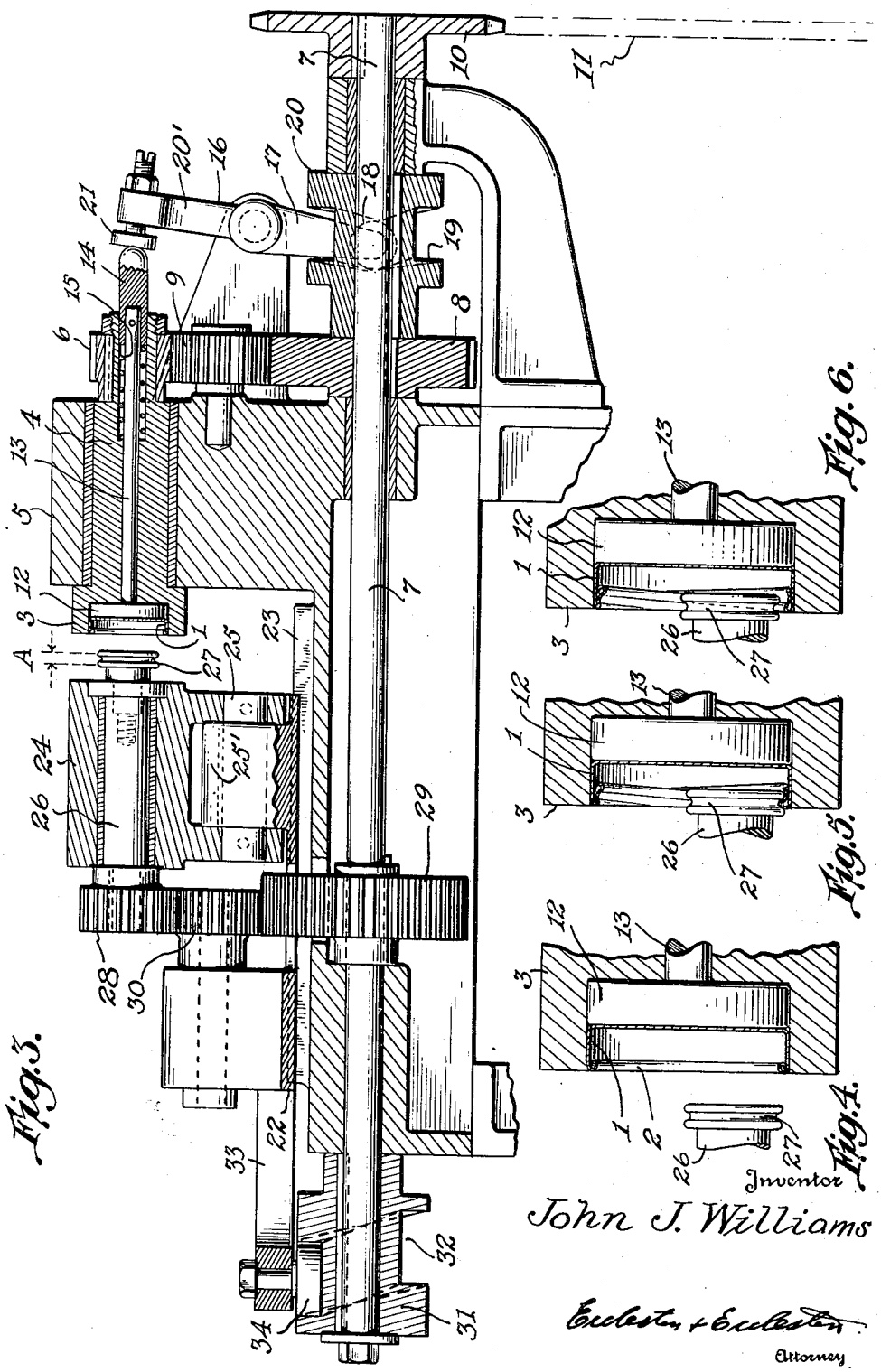

Fig. 5.

Fig. 6.

Fig. 3.

Fig. 4.

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APPARATUS FOR FORMING METAL CLOSURES

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Application September 16, 1937, Serial No. 164,262

2 Claims. (Cl. 153—72)

The invention relates particularly to an apparatus for forming single shell metallic screw caps having the threads concealed from exterior view. Single shell concealed thread caps are old, as shown by the patent to Kempien No. 725,970, April 21, 1903, but by the apparatus disclosed herein this general type of cap is made at a high rate of speed, and the caps produced are uniform in size, with properly formed threads, whereby an efficient seal is obtained.

The invention will be clearly understood from the following description, when taken in connection with the accompanying drawings, in which,

Figure 1 is a plan view of the apparatus.

Figure 2 is a vertical transverse sectional view thereof, taken on line 2—2 of Figure 1.

Figure 3 is a vertical longitudinal sectional view of the apparatus; and

Figures 4, 5 and 6 are fragmentary views illustrating the formation of the cap.

Referring to the drawings in more detail, numeral 1 refers to the shell or blank in the form in which it is delivered to the shell holder or head 3. It will be noted that the shell, prior to being delivered to the holder, is provided with an incurled bead 2. This incurled bead may be formed by engaging the edge of the blank skirt with a die having an annular curling groove, or other means may be employed for forming the incurled bead. This bead is substantially circular in cross-section, though it may be of slightly greater depth than its thickness.

The blank with the incurled bead 2 is placed in the head or holder 3 by any desired means, not shown. The shaft 4 of the holder is mounted for rotation in the frame 5, and keyed to the rear end of the holder shaft is a gear 6. The main drive shaft of the machine is indicated by numeral 7, and keyed to this shaft is a gear 8, which through gear 9 drives the gear 6 connected to the shell holder. The ratio of the gears will be as desired, preferably such that the shell holder will make about six revolutions for each revolution of the main drive shaft, though no attempt has been made to show any particular gear ratio in the drawings. The main drive shaft is continuously rotated. Any desired means may be employed for this purpose, but in the embodiment illustrated a sprocket wheel 10 is keyed to the end of the main drive shaft 7, and a sprocket chain 11, driven from any suitable source of power continuously rotates the sprocket wheel.

Numeral 12 refers to a knockout pad positioned in the shell holder 3, rearwardly of the shell. This pad has a spindle 13 which extends through the holder shaft and through the gear 6, and has an outwardly extending projection 14. A spring 15 normally holds the knockout pad in retracted position, and when the cap is completed the pad is moved to the left (Figs. 1 and 3) to eject the cap, which then falls into a suitable chute, and is carried to the desired point. A lever 16 is provided for operating the knockout pad at the desired moment. The lower arm 17 of this lever carries a roller 18 which rides in the groove 19 of a cam 20, keyed to the main drive shaft 7; and the upper arm 20' of the lever carries an adjustable lug 21 positioned to engage the outwardly projecting portion 14 of the pad spindle. Thus every time the main drive shaft makes a complete rotation, the upper arm of the lever is moved to the left (Fig. 3), to thereby eject the completed cap. The spring 15 returns the pad to its normal position.

In accordance with the present invention the screw thread is formed in the incurled bead by a chasing action, as distinguished from an ordinary threading tool, and the operation of the chasing roller will now be described.

Numeral 22 refers to a carriage which moves along ways 23. A frame 24 is pivotally mounted on the carriage by means of a pivot pin 25 mounted in a boss 25', and rotatably mounted in the frame is a shaft 26 to which is attached the chasing roller 27. In the present embodiment of the invention the chasing roller is continuously driven in the same direction, and at the same surface speed, as the blank holder. For continuously rotating the chasing roller a gear 28 is keyed to the shaft 26, and this gear is driven by gear 29 keyed to the main drive shaft, through the intermediate gear 30.

The dimension "A" of the chasing roller 27 is equal to the desired pitch of the thread to be formed in the cap; and the chasing roller is fed forward into the cap in the proper relation to the turning movement of the cap. For example, if the thread to be formed in the cap is in the proportion of eight threads to the inch, the chasing roller will be fed into the cap ⅛" while the cap makes one complete revolution.

For feeding the chasing roller into and out of the cap, a cam 31, provided with a cam groove 32, is keyed to the main drive shaft 7. An extension 33, of the carriage 23, carries a roller 34 which rides in the cam groove 32. Thus for every complete rotation of the main drive shaft, the chasing roller is fed forward and backward. Of course any desired cam is employed, depending

upon the distance the chasing roller is to be fed into the cap.

After the thread has been chased in the metal forming the incurled bead, the chasing roller must be released from the cap before the roller is moved backward to its initial position.

For the purpose of releasing the chasing roller from the completed cap, i. e., moving the roller toward a central position in the cap, a cam **35** is keyed to a shaft **36**, which shaft is continuously rotated by a gear **37** keyed thereto and meshing with gear **30**. The ratio of the gears is such that the cam will make one complete rotation for each cycle of operation of the machine. A roller **38**, carried by an extension on the frame **24**, rides on the cam **35**. At the proper moment, when the cap is completed, the cam **35** permits a spring **39** to draw the chasing roller toward a central position in the cap, thereby releasing the cap. The chasing roller is then moved backward out of the cap by means of the cam **31**, and the cam **35** swings the chasing roller into its original position to engage the incurled bead on the next cap blank when the roller is moved forward.

The operation of the machine will now be briefly described. A cap blank, with the incurled bead previously formed therein, is delivered to the continuously rotating blank holder **3**, by any desired means. In the present embodiment this holder makes approximately six revolutions for each revolution of the main drive shaft, that is, approximately six revolutions for each cycle of operation of the machine.

The chasing roller **27**, which is rotating at the same surface speed as the cap blank, is now moved forward by the cam **31**. The lateral position of the chasing roller, with respect to the cap blank, is as shown in Fig. 4. It will be noted that as the roller advances the forward bead thereon will engage the incurled bead on the cap blank just inwardly of the blank skirt, and of course it will be understood that the cap blank, as well as the chasing roller, are rotating when the chasing roller comes into contact with the incurled bead on the blank. Thus the forward bead of the chasing roller will start to flatten the forward portion of the incurled bead on the blank, at the point where the chasing bead first engages the incurled bead on the blank. The blank is rotating and the chasing roller is rotating and advancing, so that by the time the blank has made a partial rotation the forward bead of the roller is completely on the incurled bead, thereby starting the entrance end of the cap thread. The blank continues to rotate and the roller continues to advance until the complete thread has been chased, and the cap is completed. The extent of advance of the chasing roller, for a revolution of the cap, will depend on the proportionate number of threads per inch desired. If the threads are to be in the proportion of eight to the inch, the chasing roller will advance ⅛ inch within the cap blank while the blank is making one revolution.

The cap having been completed, is released from the chasing roller by moving the roller toward the center of the cap, as shown in Figure 6. This is accomplished by the operation of the cam **35** and spring **39**; the cam being timed to permit the spring to give this movement to the chasing roller as soon as the cap is completed.

The cam **31** now moves the chasing roller backward away from the completed cap, and cam **35** moves the chasing roller laterally to its original position ready to be advanced into engagement with the next cap blank. In the meantime, cam **20** has operated the knockout pad **12** to eject the completed cap, and another blank has been placed in the blank holder, and another cycle of operation commences.

It will be understood that the closures will be provided with a liner, not shown.

In the embodiment illustrated the chasing roller is positively driven, but if preferred a chasing roller running free may be employed.

Also, if preferred, the chasing roller can be set at an angle equal to the helix angle of the thread to be formed in the cap, but in the present embodiment the chasing roller is set straight, and this is made possible by reason of the fact that the width of the bead on the chasing roller is slightly less than the width of the thread desired in the cap.

Having fully described the invention, what I claim is:

1. An apparatus for forming concealed thread single-shell metallic closures, including a blank holder having a smooth internal annular wall, said holder adapted to receive a blank having an incurled bead on its skirt, said smooth annular wall supporting the blank skirt during the threading operation, means for continuously rotating the said blank holder in the same direction, a rotatable chasing tool, means for continuously rotating the chasing tool in the same direction as the blank holder, means for causing relative longitudinal movement between the chasing tool and the blank holder to move the chasing tool across the incurled bead while in engagement therewith, toward the top of the blank, to thereby bend the metal of the incurled bead into a thread, means for causing relative lateral movement between the chasing tool and the blank holder to free the tool from the blank, and means for withdrawing the chasing tool while out of engagement with the incurled bead and while the blank holder and tool continue their rotation in the same direction.

2. An apparatus for forming concealed thread single-shell metallic closures, including a blank holder having a smooth internal annular wall, said holder adapted to receive a blank having an incurled bead on its skirt, said smooth annular wall supporting the blank skirt during the threading operation, means for continuously rotating the said blank holder in the same direction, a rotatable chasing tool, two spaced beads in parallel planes on said tool, means for continuously rotating the chasing tool in the same direction as the blank holder, means for causing relative longitudinal movement between the chasing tool and the blank holder to move the chasing tool across the incurled bead while in engagement therewith, toward the top of the blank, to thereby bend the metal of the incurled bead into a thread, means for causing relative lateral movement between the chasing tool and the blank holder to free the tool from the blank, and means for withdrawing the chasing tool while out of engagement with the incurled bead and while the blank holder and tool continue their rotation in the same direction.

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