

Dec. 6, 1949

G. FIFE
METHOD AND APPARATUS FOR FINAL SHAPING
ENDS OF TUBULAR MEMBERS

2,490,343

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2 Sheets-Sheet 1

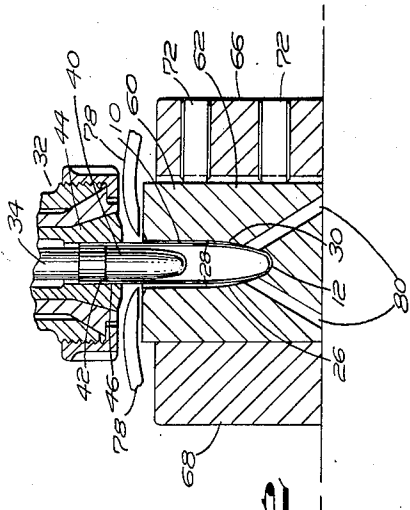


Fig. 1

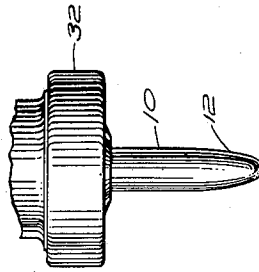


Fig. 2

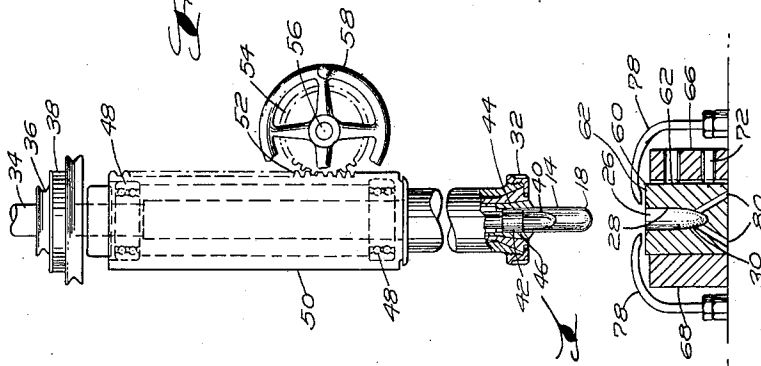


Fig. 3

INVENTOR
George Fife
BY *Thomas A. Jenckes*
ATTORNEY

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2 Sheets-Sheet 2

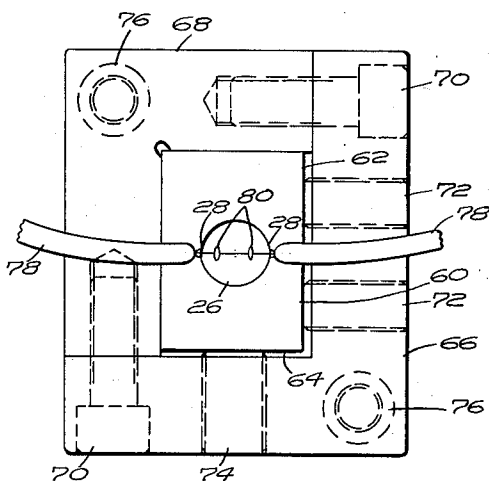


Fig. 4

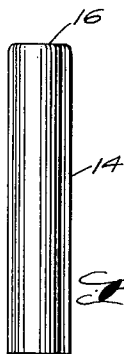


Fig. 5

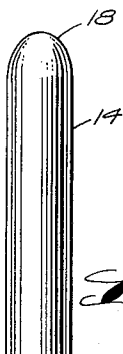


Fig. 6

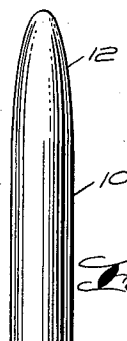


Fig. 7

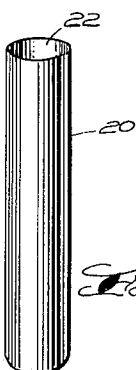


Fig. 8

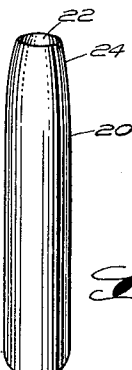


Fig. 9

INVENTOR
George Fife
BY *Thomas A. Jencks*
ATTORNEY

UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR FINAL
SHAPING ENDS OF TUBULAR MEM-
BERS

George Fife, Attleboro, Mass., assignor, by mesne
assignments, to Union Plate and Wire Co., At-
tleboro, Mass., a corporation of Massachusetts

Application August 22, 1945, Serial No. 612,074

8 Claims. (Cl. 113—52)

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My invention relates to a novel method of and apparatus for the final shaping of an end of a tubular member, such as a shell, tube, fountain pen or pencil cap, or the like, whether said end be open or closed, particularly those constructed of plated metal such as gold plate which has a thin outer layer of gold superimposed on a layer of base metal, without affecting or destroying the outer precious metal layer.

In the prior art it has been customary to accomplish this final shaping by means of swaging machines including a multiplicity of hammers for hammering or beating the metal into the desired shape. This has been a relatively slow method and the hammering itself has tended to provide an irregular, uneven, or crinkly surface, which surface has been additionally caused by the expansion caused by the heat developed by swaging, both in the swaging machines, to vary the unevenness of hammering and in the tubular members acted upon, particularly where of bimetallic layers.

My invention comprises a novel adaptation of a spinning method to achieve this final shaping and comprises relatively forcing the end of the tubular member within a hole of the desired configuration of the outer surface of the tubular member in a die member while rapidly spinning one of said members, preferably said tubular member while forcing and inserting it within said die member and lubricating the hole while inserting the end of the tubular member therein, and also includes suitable apparatus for this purpose.

I have found that by employing my method that production may be increased at least three hundred per cent over the former swaging method, and I have found by experience that the tubular member may be taken immediately out without retaining it in the hole for any length of time.

A further object of my invention is to save the cost of the machine tools necessary in swaging. Due to the minimum amount of wear with which my improved method is accomplished, it is obvious that the simple punch and die tools required thereby last for a long period of time.

These and such other objects of my invention as may hereinafter appear will be best understood from a description of the accompanying drawings which illustrate my improved method and suitable apparatus for carrying it out.

In the drawings,

Fig. 1 is a side elevation of a suitable punch

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and die for carrying out my improved method, portions of the punch and die being shown in section, showing the rapidly spinning tubular member in alignment with and at a spaced distance from the forming hole in the die.

Fig. 2 is a sectional view of the punch and die shown in Fig. 1 with the tubular member completely inserted within the hole at the bottom of its down stroke.

Fig. 3 is a diagrammatic side elevation of the punch and attached tubular member after it has been raised from the hole with the tubular member changed into the desired end shape from that shown in Fig. 1.

Fig. 4 is a plan view of the die.

Figs. 5, 6, and 7 are side elevations respectively of a closed end tube illustrating the three steps employed for final shaping, with Fig. 5 illustrating the flat end tube as it comes from a press, Fig. 6 illustrating how it is initially domed in a foot press, and Fig. 7 illustrating the tube after it has been finally shaped with a smooth surface by my improved method.

Figs. 8 and 9 illustrate my method of finishing an open ended tube, Fig. 8 illustrating it after the suitable length of material has been cut off a longer tube, and Fig. 9 illustrating it after it has been finally shaped in accordance with my improved method.

In the drawings, wherein like characters of reference generally indicate like parts throughout, 10 generally indicates a tubular member having an end 12 final shaped in accordance with my invention. Said tubular member 10 may comprise any type of a shell, tube, or the like, including a fountain pen or a pencil cap. When making a closed end tube as shown in Figs. 5 to 7, the tube 14 is first formed in a press with the closed flat end 16 as shown in Fig. 5, which closed end 16 is then domed in a foot press as at 18, as shown in Fig. 6. As shown in Fig. 1, the blank 14 having a domed end 18 is then shaped into the finished article having a configuration shown in Figs. 7, 2 and 3, with the end 12 in the final shape shown, or in any other desired variation thereof. When final shaping an open ended tube, it is merely necessary to take a tube 20 having the open end 22 and final shape the portion 24 adjacent the open end 22 in the manner shown in Fig. 9 in accordance with my improved method, or on the suitable apparatus therefor shown.

My improved method of final shaping shown herein comprises relatively forcing said tubular member 10 within a hole 26 of the desired con-

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figuration 30 of the outer surface of the tubular member in a die member while rapidly spinning either said die member or tubular member.

In the improved embodiment of method shown in Figs. 1 to 3, I preferably rapidly spin the blank tubular member 14 by any suitable means, or in any suitable manner, and relatively force said rapidly spinning tubular member into said hole 26 while lubricating said hole. While my improved method may be accomplished by hand or by any suitable type of apparatus, I have shown in Figs. 1 to 4 a suitable variation of a punch and die for carrying out my improved invention. In the claims, I employ the phrase "rapidly spinning" to include a spinning movement of over a thousand R. P. M.'s preferably around seven-

teen hundred R. P. M.'s. In the preferred embodiment shown, I provide a punch 32 mounted on the lower end of a rotatable spindle 34 having pulleys 36 or other means thereon for the rapid revolution thereof by a belt 38 or other suitable means, and having an arbor 40 on the lower end thereof to receive the open end 42 of the tubular member opposite from the end 18 it is desired to shape, and a clutch 44 for clamping the rim 46 of said open end 42 against the outer surface of said arbor 40. The spindle 34 carrying the punch 32 is rotatably supported by the ball bearings 48 on the non-rotatable sleeve 50 which is provided along a vertical line thereof with the rack teeth 52 in mesh with the rack gear 54 mounted on a shaft 56 on which the handle 58 is mounted. It is obvious that a partial revolution of the shaft 56 by the handle 58 causes the gear 54 to mesh with the rack teeth 52 to raise or lower the whole non-rotatable sleeve 50, spindle 34 and punch 32 carrying the tubular member 14 on the lower end thereof so as to bring said tubular member within the hole 26 and raise it therefrom. It is obvious however that any suitable means may be employed for raising and lowering the spindle 34, the clutch 42, arbor 40 and attached tubular member 14 relatively within said hole 26.

I have shown in Figs. 1, 2 and 4 a suitable type of die 60 having a hole 26 therein for receiving the end of the tubular member 14 to be shaped. As stated, the hole 26 must have lubricating groove means 28 extending substantially throughout its length to provide suitable lubrication. While groove means 28 may be constructed in any suitable shape, they are preferably formed by making said hole 26 oval in section to permit the end 12 of the tubular member 10 to rapidly revolve within said hole 26. For this purpose the die 60 comprises the two parts 62 and 64. These are initially separated by shims while the cylindrical hole 26 is bored therein and on removal of said shims said parts 62 and 64 are compressed together leaving the oval diametric extensions 28 on said hole 26. In the embodiment shown the die parts are held together by two L-shaped clamp members 66 and 68, which are suitably clamped together by bolts 70 and the die parts are retained in clamped position therein by the lateral bolts 72 and the end bolt 74. The entire die and its clamp may be clamped to the table by the vertical bolts 76.

As stated, I provide means to suitably lubricate the hole 26 during the insertion of the tubular member 10. In the embodiment shown, these comprise the feed ducts 78 projecting upwardly from the table from a suitable source of lubricant supply and discharging within said hole 26, the

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groove means 28 extending axially of the hole and to prevent the accumulation of dirt or oil within said hole, I also provide the oil discharge ducts 80 projecting downwardly, preferably obliquely, as shown near the bottom of said hole 26.

In use, the tubular member 14 having a domed end 18 has its free end 42 clamped between the clutch 44 and arbor 40 at the lower end of the punch 32, and the punch 32 is brought into alignment with the hole 26, the punch 32 being rapidly spun by the rotating spindle 34 in the manner indicated. The hand wheel 58 is then slowly turned in a manner to lower the spinning tubular end 18 within the hole 26 to the position assumed in Fig. 2 when said end 18 is shaped into its final end shape 12, as shown in Figs. 2 and 3. It is merely necessary to lower and force said spinning member within said hole gently, and I have found that the end shaping is substantially complete when the tubular member 10 is completely forced within said hole 26 without retaining it there for any period of time. The punch 32 and finally shaped tubular member 10 may be then lifted out of the hole to the position shown in Fig. 3 when the completely shaped tubular member 10 may be completely removed and another blank 14 inserted for the repetition of my improved method.

It is therefore apparent that I have provided a novel method of final shaping a tubular member and suitable apparatus therefor with the advantages explained above.

It is understood that my invention is not limited to the specific embodiments shown or methods described and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What I claim is:

1. The method of final shaping an end of a tubular member, such as a shell, tube, fountain pen or pencil cap, or the like, which comprises spinning said tubular member, and relatively forcing the end of said rapidly spinning member within a hole of the desired configuration of the outer surface of the tubular member, while continuously feeding lubricant between the inner surface of the hole and the outer surface of the tubular member inserted within said hole to provide a continuous changing film of cooling lubricant between the entire areas of said surfaces.

2. The method of final shaping an end of a tubular member, such as a shell, tube, fountain pen or pencil cap or the like, which comprises relatively forcing the end of said tubular member within a hole of the desired configuration of the outer surface of said tubular member in a die member, while spinning one of said members and continuously feeding lubricant between the inner surface of said hole and the outer surface of the tubular member inserted within said hole to provide a continuous changing film of cooling lubricant between the entire areas of said surfaces.

3. Apparatus for final shaping an end of a tubular member, such as a shell, tube, fountain pen or pencil cap, or the like, comprising a stationary die member having a hole of the configuration of the desired finished outer surface of the tubular member, means to spin said tubular member in alignment with and at a spaced distance from said hole, means to relatively lower and force the end of said spinning member within said hole, and means to continuously feed lubricant between the inner surface of said hole and the outer surface of the tubular member in-

serted within said hole to provide a continuous changing film of cooling lubricant between the entire areas of said surfaces.

4. Apparatus for final shaping an end of a tubular member, such as a shell, tube, fountain pen or pencil cap, or the like, comprising a die member having a hole of the configuration of the desired finished outer surface of the tubular member, means to relatively lower and force the end of said tubular member within the hole, means to spin one of said members as said tubular member sinks within said hole, and means to continuously feed lubricant between the inner surface of said hole and the outer surface of the tubular member inserted within said hole to provide a continuous changing film of cooling lubricant between the entire areas of said surfaces.

5. Apparatus for final shaping an end of a tubular member, such as a shell, tube, fountain pen or pencil cap, or the like, comprising a stationary die member having a hole of the configuration of the desired finished outer surface of the tubular member but slightly oval in section to form diametric groove means extending axially thereof, means to spin said tubular member in alignment with and at a spaced distance from said hole, means to relatively lower and force the end of said spinning member within said hole, means for continuously flowing lubricant into said groove means while the tubular member is being shaped in the hole, and oil discharge duct means projecting downwardly from near the bottom of the hole.

6. Apparatus for final shaping an end of a tubular member, such as a shell, tube, fountain pen or pencil cap, or the like, comprising a stationary die member having a hole of the configuration of the desired finished outer surface of the tubular member having groove means extending axially thereof, means to spin said tubular member in alignment with and at a spaced distance from said hole, means to relatively lower and force the end of said spinning member within said hole, means for continuously flowing lubricant into said groove means while the tubular member is being shaped in the hole, and oil discharge duct means projecting downwardly from near the bottom of the hole.

7. Apparatus for final shaping an end of a tubular member, such as a shell, tube, fountain pen or pencil cap, or the like, comprising a die member having a hole of the configuration of the desired finished outer surface of the tubular

member but slightly oval in section to form diametric groove means extending axially thereof, means to relatively lower and force the end of said tubular member within said hole, means to spin one of said members as said tubular member sinks within said hole, means for continuously flowing lubricant into said groove means while the tubular member is being shaped in the hole, and oil discharge duct means projecting downwardly from near the bottom of the hole.

8. Apparatus for final shaping an end of a tubular member, such as a shell, tube, fountain pen or pencil cap, or the like, comprising a die member having a hole of the configuration of the desired finished outer surface of the tubular member having groove means extending axially thereof, means to relatively lower and force the end of said tubular member within said hole, means to spin one of said members as said tubular member sinks within said hole, means for continuously flowing lubricant into said groove means while the tubular member is being shaped in the hole, and oil discharge duct means projecting downwardly from near the bottom of the hole.

GEORGE FIFE.

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