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TIP FOR MECHANICAL PENCILS OR THE LIKE

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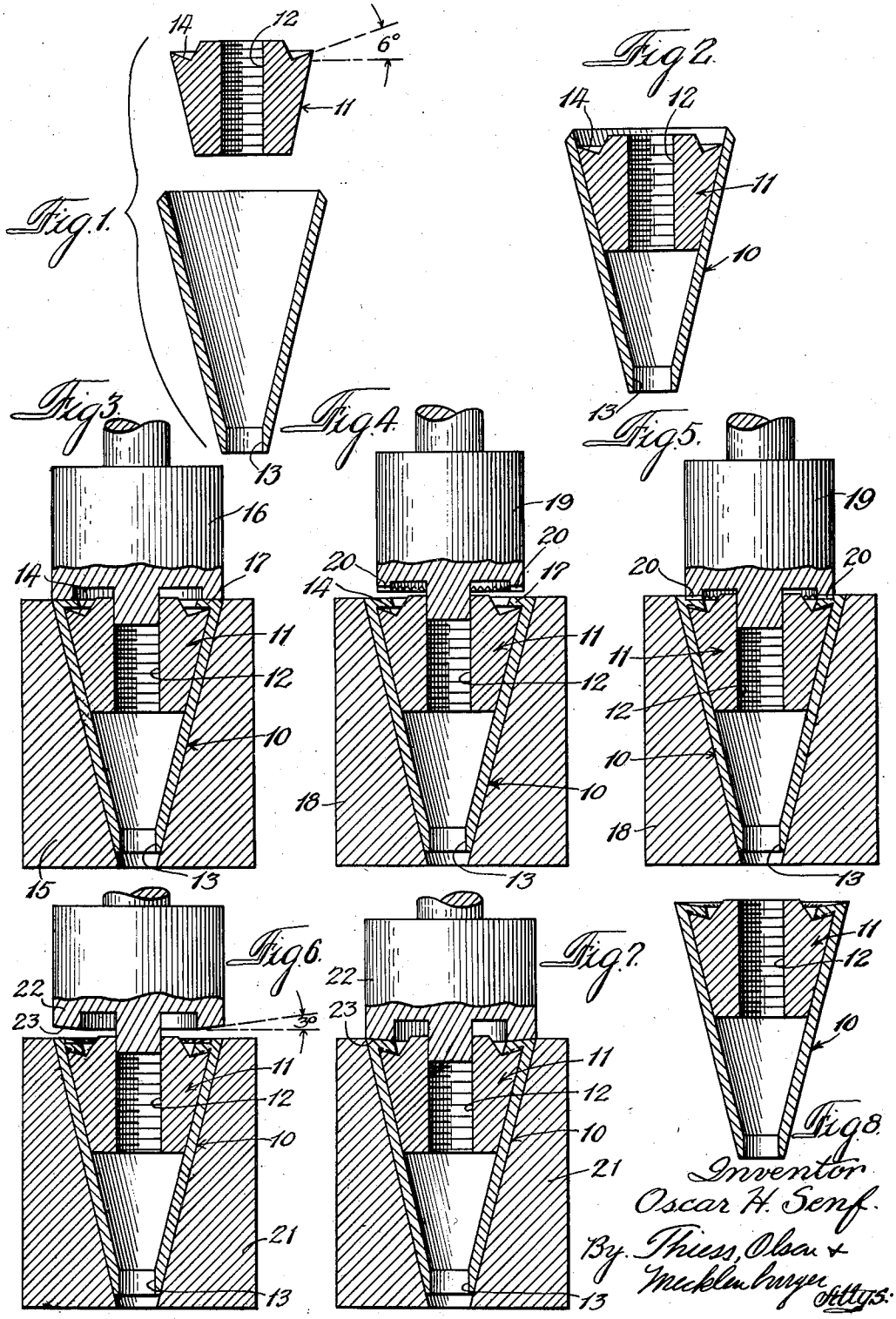

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TIP FOR MECHANICAL PENCILS OR THE LIKE

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10 Claims. (Cl. 120—9)

This invention relates to a metallic tip for mechanical pencils or the like and to the method for making the same, and has special reference to a tip for the writing point end of a mechanical pencil, the tip having an axial opening therethrough of a diameter to permit the passage of a pencil lead.

More particularly, this invention has reference to a tip for a mechanical pencil or the like comprising a metallic shell and a bushing in one end opening of the shell for connection with an end of the pencil, the bushing having an annular undercut on one end adjacent the periphery thereof and the shell having one end thereof bent over to engage the undercut. The invention also has particular reference to the method of forming a tip for a mechanical pencil or the like consisting in forming a conical-shaped shell, inserting a bushing into the enlarged end opening of the shell, in bending the enlarged end of the shell over one end of the bushing, and in fixing the bent-over end of the shell on the adjacent end portion of the bushing.

It has been found desirable in many instances to use a tip of stainless steel in order that the thickness of the material of the tip may be reduced to a minimum. Where, for example, it may be necessary to guide a pencil with a straight-edge in producing a line, such pencils being employed by draftsmen, engineers, and the like, it is desirable that a minimum clearance be had between the side wall of the marking medium extending from the tip and the guide against which the tip is rested. Heretofore, the usual tip for mechanical pencils or other marking instruments has been formed of a relatively soft base metal some times plated with a precious metal and such soft metals thus employed are of a comparatively great thickness since a substantial strength is required in supporting the lead or marking medium projecting therethrough and in opposing stresses such as are occasioned by dropping the marking instrument at the tip end thereof on a hard surface. In producing a tip of substantial strength from a relatively thin material, it has been found necessary or at least desirable to depart from the usual methods employed in assembling the elements necessary for the formation of the tip.

A step forward in the art has been accomplished in the method and structure of the Lindemon Patent No. 1,872,151 issued August 16, 1932. The present invention is an improvement over the above mentioned patent in obtaining a more secure assembly between the bushing and the shell forming the tip and aside from the structural advantages obtained the present method simplifies the operations necessary in forming the tip. While the structure and method to be hereinafter recited are desirable in connection with any metallic materials, it is particularly adapted for use with a bushing of a relatively soft metal and a shell of relatively hard thin material.

One of the objects of this invention is to provide a tip for a mechanical pencil or the like of the character indicated above in which the assembly of the shell and bushing thereof is secured at a maximum strength.

It is a further object of this invention to provide a tip for a mechanical pencil or the like of the hereinabove noted type for securing a shell of relatively great hardness and of minimum thickness to a relatively soft bushing.

It is also an object of this invention to provide a method of forming a tip for a mechanical pencil or the like of the type hereinabove mentioned wherein the operations of assembling the bushing and the shell are reduced to a minimum.

Other objects and advantages of this invention will hereinafter be more particularly pointed out and, for a more complete understanding of the characteristic features of this invention, reference may now be had to the following description when taken together with the accompanying drawing, in which latter:

Figure 1 is a central vertical sectional view of the shell blank and bushing in a separated relation, the members forming the tip embodying the features of this invention;

Fig. 2 is a view similar to Fig. 1 showing the elements of Fig. 1 in an assembled relation prior to the initial operation thereupon by the forming tools;

Fig. 3 is a central longitudinal sectional view of the assembled shell and bushing shown in Fig. 2 after the first operation of the punch and die thereon to bend a portion of the enlarged end of the shell over one end of the bushing;

Fig. 4 is a view similar to Fig. 3 showing an initial position of the punch and die members in staking the bent-over end of the shell on the adjacent end portion of the bushing;

Fig. 5 is a view similar to Fig. 4 showing a completion of the operation of staking the bent-over end of the shell on the adjacent end portion of the bushing;

Fig. 6 is a view similar to Fig. 5 showing an initial position of punch and die members prior to pressing the staked end portion of the shell at

an angle different from the angle of the engaged surface of the bushing;

Fig. 7 is a view similar to Fig. 6 showing a completion of the pressing operation shown in an initial position in Fig. 6; and

Fig. 8 is a central longitudinal sectional view of the completed bushing formed in the preceding operations.

Referring now more particularly to the drawing, the structure of the present invention comprises a conical-shaped metallic shell 10 and a substantially frusto-conically shaped bushing 11. The shell 10 may be processed on a screw machine from a piece of rod stock by drilling out the inside of the rod and swaging the resultant shell into a conical shape, or the shell may be swaged from tubing into its conical shape. The material of the shell 10 is preferably of stainless steel in order that the thickness thereof may be reduced to a minimum and yet have at least the same strength as a shell of substantially greater thickness of a softer material.

The bushing 11 is preferably formed from a rod of brass, bronze, or other relatively soft material, the bushing being provided with a threaded axially extending bore 12 for threadedly engaging a guide tube or similar element on the end of a pencil. The apex of the conical shaped shell 10 is provided with an aperture 13 of a size to snugly engage a pencil lead which may be extended therethrough from the guide tube of the pencil. While it has been specified that the shell 10 is formed of stainless steel, it is, of course, to be understood that any other material sufficiently hard for the purpose may be substituted therefor and that the bushing may likewise be of any material consistent with its use, the specific materials mentioned being for purposes of illustration.

The bushing 11 is inserted in the enlarged open end of the conical-shaped shell 10 as shown in Fig. 2 to a depth such that a portion of the shell projects beyond the base of the bushing. By the term "base of the bushing" is meant the largest diameter thereof, the base having an annular angular undercut 14. The end edge of the portion of the shell extending beyond the base of the bushing is faced angularly with respect to the horizontal, the degree of angularity being approximately sixty degrees.

The assembled shell and bushing shown in Fig. 2 are disposed in a die 15, and a punch 16, coming down on the angularly faced portion of the shell projecting beyond the base of the bushing, bends the extending portion of the shell over a portion of the base of the bushing. The bent-over portion 17 of the shell extends substantially at right angles to the axes of the shell and bushing, the face of the engaging portion of the die lying in a substantially horizontal plane or at right angles to the axes of the shell and bushing.

The assembled bushing and shell resulting from the first operation are thereafter placed in a second die 18 for operation upon by a punch 19. The engaging face of the punch 19 is provided with a plurality of radially extending teeth 20 which, when the punch is operated in the direction of the die, stakes the bent-over edge 17 on the surface of the angularly extending undercut 14, the teeth projecting into the material of the bent-over portion 17 and forming ridges in the underneath surface thereof and co-operating depressions in the surface of the undercut portion 14 of the bushing to prevent relative rotation therebetween.

The assembled and staked bushing and shell thus formed by the second operation shown in Figs. 4 and 5 is next inserted in a die 21 for operation upon by a punch 22. The engaging face 23 of the punch 22 is smooth and angularly inclined relative to a plane at right angles with the axes of the assembled shell and bushing. It has been found preferable to form the engaging face 23 at about a three-degree angle with respect to a plane at right angles to the longitudinal axes of the shell and bushing, this angle being different than the angle of the surface of the undercut which latter has been found preferably to be at an angle of six degrees.

The punch 22 is pressed firmly or struck against the bent-over and staked portion 17 of the shell to iron out the top surface. The ironing of the top surface eliminates a trimming operation such as has been found to be desirable in the structure of the aforementioned Lindemon Patent No. 1,872,151. Such a trimming operation as has been performed in the above noted patent produces a pilot corresponding to the pilot 24 of the present construction of the correct diameter and size and of a smooth uniform surface on the top of the shell so that a good joint is obtained between the tip and the end of the pencil. The trimming operation is not necessary in the present invention since the pressing or ironing operation performed by the punch 22 effects the same correctness in diameter and size and also the smooth uniform surface on the top of the shell. The same desirable joint is obtained between the tip and the end of the pencil in the pressing and ironing operation as has been obtained prior hereto in the trimming operation.

The present method provides a better and more secure assembly between the bushing and the tip as compared to previous assembly operations and saves at least the operation of trimming which, no matter how carefully it had heretofore been handled by upsetting as in the above Lindemon patent, decreases the thickness of the upset end so that there is a possibility of cutting away too much of the metal to thus weaken the assembly. The method of the present application is particularly adaptable where a shell of a hard material such as stainless steel is used. The staking operation, which is important in connection with a shell of stainless steel, is not actually necessary where a softer material such as gold filled stock on a base is used, since the top portion of the bushing over which the projecting portion of the shell is bent may be knurled or roughened so that when the shell is bent thereover the engaging surfaces may interlock by reason of the knurling. However, in both instances, that is, where a stainless steel shell is employed or where a shell of softer material is employed, the ironing or finishing operation for smoothing the surface to obtain a desired joint between the tip and the end of the pencil is desirable to eliminate the trimming operation.

The tip thus formed by the method above described results in a conical-shaped bushing secured to a conical-shaped metallic shell in the enlarged end opening thereof for connection with the end of a pencil, the bushing having an annular angular undercut on the enlarged end adjacent the periphery thereof on which one end of the shell is bent over to engage the undercut. The engaged ends of the pencil and the bushing are staked together and the bent-over portion of the shell is of non-uniform thickness owing to the degree of angularity of the engaging surface of the punch employed in the final operation be-

ing different than the angularity of the surface of the annular undercut.

While but a single embodiment of this invention is herein shown and described, it is to be understood that various modifications thereof may be apparent to those skilled in the art without departing from the spirit and scope of this invention and, therefore, the same is only to be limited by the scope of the prior art and the appended claims.

I claim:

1. A tip for a mechanical pencil or the like comprising a metallic shell, and a bushing in one end opening of said shell for connection with an end of said pencil, said bushing having an annular undercut on one end adjacent the periphery thereof, one end of said shell having a bent-over portion engaging said undercut.

2. A tip for a mechanical pencil or the like comprising a metallic shell, a bushing in one end opening of said shell for connection with an end of said pencil, said bushing having an annular undercut on one end adjacent the periphery thereof, one end of said shell having a bent-over portion engaging said undercut, and ridges on said bent-over portion engaging depressions on the undercut portion of said bushing to prevent relative rotation therebetween.

3. A tip for a mechanical pencil or the like comprising a conical-shaped metallic shell, and a conical-shaped bushing in one end opening of said shell for connection with an end of said pencil, said bushing having an annular angular undercut on the enlarged end adjacent the periphery thereof, one end of said shell having a bent-over portion engaging said undercut, the outer surface of said bent-over portion of said shell extending at a different angle to the surface of said angular undercut.

4. A tip for a mechanical pencil or the like comprising a conical-shaped metallic shell, and a conical-shaped bushing in one end opening of said shell for connection with an end of said pencil, said bushing having an annular undercut on the enlarged end adjacent the periphery thereof with the surface thereof extending angularly in the direction of the smaller end, one end of said shell having a bent-over portion engaging said undercut, the outer surface of said bent-over portion of said shell converging radially outwardly with respect to the surface of said undercut.

5. A tip for a mechanical pencil or the like comprising a conical-shaped metallic shell, and a conical-shaped bushing in one end opening of said shell for connection with an end of said pencil, said bushing having an annular angular undercut on the enlarged end adjacent the periphery thereof, one end of said shell having a bent-over portion engaging said undercut, said bent-over portion being of non-uniform thickness.

6. The method of forming a tip for a mechanical pencil or the like consisting in forming a conical-shaped shell, inserting a bushing into the enlarged end opening of said conical shell, in bending the enlarged end of said shell over one end of said bushing, and in staking the bent-over end of said shell on the adjacent end portion of said bushing.

7. The method of forming a tip for a mechanical pencil or the like consisting in forming a conical-shaped shell, inserting a conical-shaped bushing having an annular undercut at the enlarged end thereof into the enlarged end opening of said conical shell, in bending the enlarged end of said shell over the undercut end of said bushing, and in staking the bent-over end of said shell on the adjacent end portion of said bushing.

8. The method of forming a tip for a mechanical pencil or the like consisting in forming a conical-shaped shell, inserting a conical-shaped bushing having an annular angular undercut at the enlarged end thereof into the enlarged end opening of said conical shell, in bending the enlarged end of said shell over one end of said bushing, in staking the bent-over end of said shell on the adjacent end of said bushing, and in pressing the bent-over end of said shell at an angle different from the angle of the surface of said undercut.

9. The method of forming a tip for a mechanical pencil or the like consisting in forming a conical-shaped shell, inserting a conical-shaped bushing having an annular angular undercut at the enlarged end thereof into the enlarged end opening of said conical shell, in bending the enlarged end of said shell over one end of said bushing, and in pressing the bent-over end of said shell on the adjacent end portion of said bushing at an angle different from the angle of the surface of the undercut.

10. The method of forming a tip for a mechanical pencil or the like consisting in forming a conical-shaped shell, inserting a conical-shaped bushing having an annular angular undercut at the enlarged end thereof into the enlarged end opening of said conical shell, in bending the enlarged end of said shell over one end of said bushing, in staking the bent-over end of said shell on the adjacent end of said bushing, and in pressing the staked end of said shell at an angle converging radially outwardly with respect to the surface of said undercut.

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