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TOOL FOR ASSEMBLING MECHANICAL PENCILS

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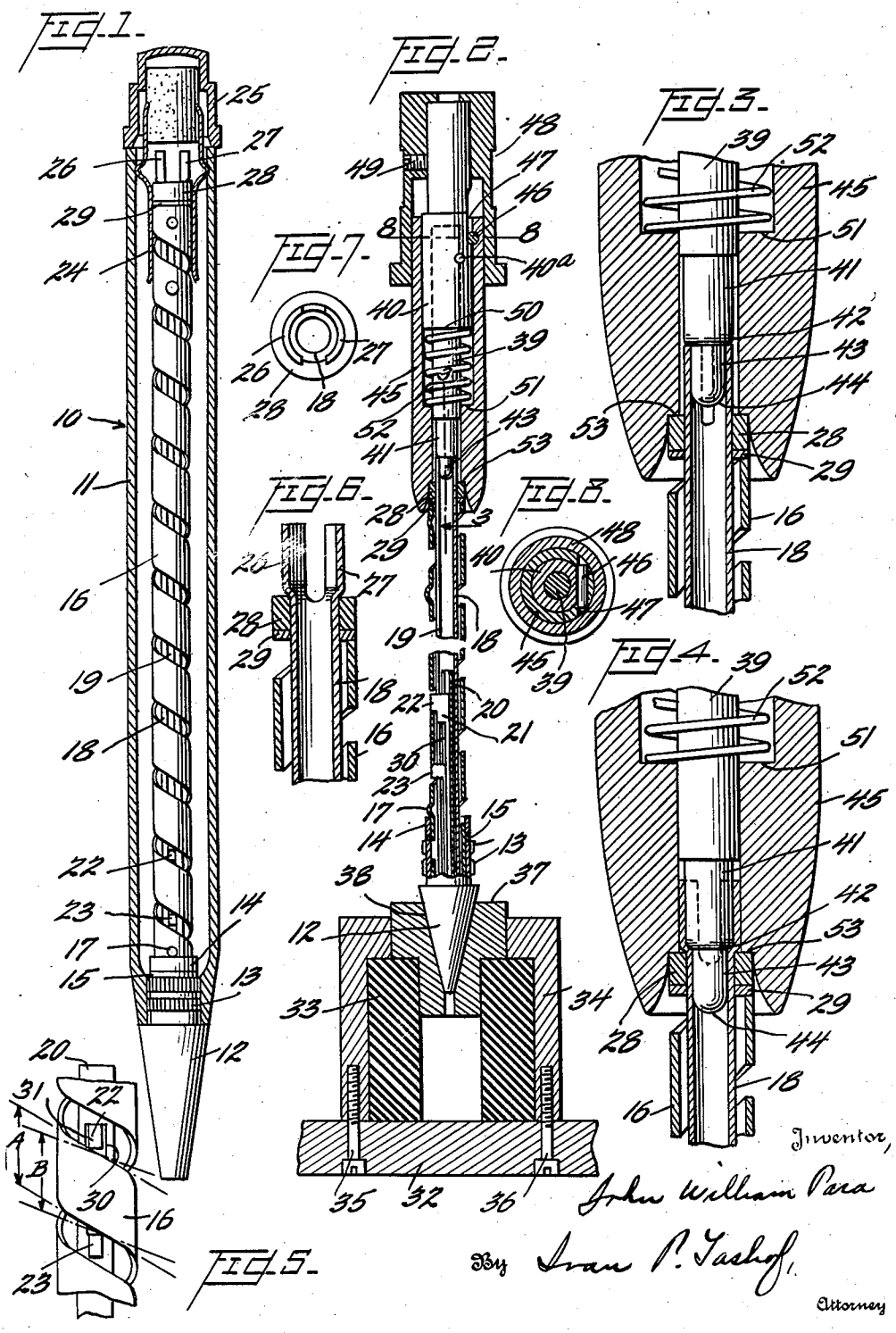

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TOOL FOR ASSEMBLING MECHANICAL PENCILS

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7 Claims. (Cl. 153—79)

The present invention relates to a tool for assembling a mechanical pencil.

More particularly, the present invention relates to a tool including a die member which is particularly adapted to assemble the spiral of a screw type mechanical pencil with the runner tube thereof so that the spiral is maintained under a pre-determined definitely ascertained tension.

The particular type of pencil which is assembled by the tool of the present invention consists in general of the writing spiral or screw which is rotatable relative to a stationary longitudinally slotted runner tube.

Motion is imparted to the lead by means of a lug on a lead carrier which cooperates with the convolutions of the spiral and the slot in the runner tube, and is essentially produced by the relative movement between the spiral and runner tube.

The pencil which is produced by the die or tool of the present invention is described and claimed in the co-pending application of John William Para, Serial No. 356,235, filed September 10, 1940, and now Patent No. 2,293,622, granted August 18, 1942, of which this application is a division. Certain elements of the novel pencil are also claimed in the co-pending application of Julius M. Kahn and John William Para, Serial No. 329,958, filed April 16, 1940 and now Patent No. 2,293,621, granted August 18, 1942.

One of the difficulties encountered in a mechanical pencil of the general character described is the loosening of the various parts due to wear after they have been in use for any considerable period of time. This has been overcome in the pencil described in the forementioned co-pending application by imparting to the spiral a certain amount of spring tension or compression in order to prevent the too easy movement or rotation of the spiral relative to the runner tube.

Necessarily it is rather difficult in any conventional type of tool to impart to the spiral a desirable amount of tension which will prevent too easy movement of the various parts and at the same time avoid imparting to the spiral too great a compression or spring tension which will make the pencil difficult to operate for expelling and retracting lead. Since the effect of compressing the spiral is to change the effective distance between convolutions, the amount of spring compression is extremely critical, since otherwise the lead carrier lug and the ejector lug will not be properly spaced between convolutions.

It is one of the objects of the present invention, therefore, to provide a novel tool for imparting a pre-determined amount of tension to the spiral of a mechanical pencil when the spiral and runner tube are assembled.

A second object of the present invention is to provide a tool which will enable a spiral and runner tube of a mechanical pencil to be assembled under a definite amount of compressive stress without any damage or twist being imparted to the spiral or the remaining elements of the pencil.

A third object of the present invention is to provide a tool for the assembly of a spiral and the remaining members of the mechanical pencil which is adapted to automatically impart the desired amount of tension or compressive stress to the spiral.

A fourth object of the present invention is to provide a tool consisting of a plurality of telescoping members separated by a spring which will automatically impart a pre-determined amount of spring tension operating upon the telescoping members which will in turn impart the tension of the spring to a spiral being acted upon by the members.

A fifth object of the present invention is to provide a novel tool including a cushion supporting member adapted to conform to the lower end of a pencil and support the same while preventing injury thereof during assembly.

Other objects and advantages of the present invention will become apparent from the subsequent specification and figures of the drawing, wherein:

Figure 1 is a vertical section of a mechanical pencil adapted to be assembled by the tool of the present invention.

Figure 2 is a section of a pencil mechanism and tool for assembling the same.

Figure 3 is a section taken on the line 3—3 of Figure 2, showing a detail of the upper pencil assembly and the tool wherein the upper portion of the pencil is turned at 180° relative to the position shown in Figure 2.

Figure 4 is a view similar to Figure 3, showing punch member of the tool in lowered position.

Figure 5 is a partly diagrammatic detail of the spiral lead carrier and ejector lugs of the pencil illustrating the effects of spiral compression.

Figure 6 is a section of the upper portion of a pencil runner tube and spiral in assembled position.

Figure 7 is a plan view of the assembly of Figure 6.

Figure 8 is a horizontal section taken along the line 8—8 of Figure 2.

Referring to Fig. 1, a mechanical pencil is indicated in general by the reference numeral 10, and includes a barrel 11 of any suitable material, preferably plastic, and a metallic tip 12 immovably joined to the barrel 11 as by a ribbed extension 13. The ribbed extension 13 carries on its upper face a pair of anti-friction washers 14 and 15 which surround and support a rotating spiral 16, the spiral 16 being provided with a projection 17 which bears on the upper surface of the washer 14 to rotatably support the spiral. Fixed immovably in the tip 12 and extending upwardly within the spiral is a runner tube 18 which is provided with a longitudinal slot 19. Within the runner tube there is provided a lead carrier 20 and an ejector 21. The ejector is telescopically mounted within the lead carrier, and is provided with a lug 22 which extends through a slot in the lead carrier and cooperates both with the longitudinally extending slot 19 of the runner tube and the convolutions of the spiral in a manner well known in the art. The lead carrier is also provided with a lug 23 which normally also extends through the longitudinal slot 19 and between the convolutions of the spiral 16. During operation of the pencil, as will be understood, the lugs 22 and 23 move upwardly and downwardly between the convolutions of the spiral and are spaced apart a single convolution.

The upper end of the spiral 16 cooperates with an actuating member 24 which is adapted to be rotated by the cap 25 of the pencil. The upper end of the runner tube terminates in a pair of ears 26 and 27 which are offset in the assembled form of the pencil, as shown particularly in Fig. 6. The offset ears 26 and 27 bear on a metal annulus member 28 and a fiber anti-friction washer 29 which is in turn positioned on the upper end of the spiral.

As will be seen from the foregoing description, the spiral in asembled form is held by the ears 26 and 27 between the members 28 and 29 at its upper extremity, and the members 14 and 15 at its lower extremity. If, therefore, compression is imparted to the spiral during assembly, and prior to the bending of the ears 26 and 27, this compression will be maintained after the ears are offset.

Referring again to the co-operation of the lugs 22 and 23 with successive convolutions of the spiral, Fig. 5 is intended to represent somewhat diagrammatically a portion of a spiral prior to assembly. The distance between successive convolutions of the spiral is represented by the character A. As the spiral is compressed, the distance between the successive convolutions is lessened, and the pitch of the spiral is decreased. This lessened distance being represented by the reference character B. Since the lugs 22 and 23 bear on the spiral at the upper and lower surface of a single convolution, it is evident, therefore, that if the distance between these lugs is fixed, that after tensioning they will tend to bear with a lesser amount of friction on the spiral proper.

Referring again to Figure 5, it will be noted that the length of the slot 30 in the lead carrier is such that the ejector lug 22 which projects through the lead carrier is in contact with the upper end of the slot at 31 when in contact with the upper surface of the spiral convolution. It is desired to point out that preferably prior to the tensioning of the spiral, the convolution is so proportioned and the maximum distance possible between the lugs 22 and 23 is such that the lugs when a maximum distance apart engage the spiral with considerable friction. When the spiral is compressed therefore, and the effective distance between convolutions decreased, the lugs 22 and 23 will fit snugly against the spiral with a lesser amount of friction. This enables the spiral and lugs to move smoothly relative to one another, while at the same time tending to prevent any undue amount of rearward motion of the lugs in the spiral during writing.

It is desired to further point out that as the lugs and spiral convolutions wear, the lugs would normally tend to loosen up. This phenomena, however, is counteracted by a gradual decrease in the compression of the spiral which usually takes place after the pencil has been in use for a considerable length of time. This decrease in compression will, therefore, tend to tighten up the contact between the lugs and the top and bottom of a spiral convolution, and a pencil constructed in accordance with the present invention will, therefore, function satisfactorily, even after it has been worn to a considerable extent.

Referring to Figures 2, 3, 4 and 8, it will be noted that there is here shown a novel tool for the assembly of a pencil of the character described. The tool consists of a base member 32 supporting a cushioning member or pressure pad 33, preferably formed of soft rubber or leather, and held on the base member 32 as by a bracket 34. The bracket 34 is firmly fastened to the base member 32 by the screws 35 and 36. The cushioning member 33 in turn supports a bushing 37 having a conical shaped recess 38 extending downwardly from its upper surface and shaped to receive the tip of a pencil, as shown in Fig. 2. The bushing 37 is slidably mounted within the bracket 34 and bears directly on the upper surface of the cushioning member 33. It is, therefore, apparent that if any undue pressure is exerted on the tip of the pencil, the cushion 33 will yield and prevent damage to the pencil mechanism.

As previously described, the runner tube 18 of a pencil of this character is fixed in the tip and extends upwardly therefrom. In the pencil mechanism, as shown in Fig. 2, the spiral, however, is only loosely mounted around the runner tube 18, and the washers 28 and 29 are also similarly loosely mounted above the spiral on the runner tube. The upper portion of the compressing tool consists of a punch 39 held in a holder 40 as by a pin 40a. The punch includes a reduced section 41, having a rounded off shoulder 42 at its lower extremity, and a further reduced section 43 extending from the rounded off shoulder 42. The lowermost reduced section 43 also is provided with a rounded tip 44 which facilitates the entry of the reduced section 43 into the runner tube. The section 43 is approximately similar in size to the internal size of the runner tube, and the reduced section 41 is approximately equal in size to the outside dimensions of the runner tube for a purpose to be hereinafter described.

Slidably mounted above the punch and punch holder is a sleeve member 45 which is assembled with the punch holder by means of a transversely extending pin 46, as shown particularly in Fig. 8. The pin 46 bears against and cooperates with a flattened section 47 on the punch holder. The downward and upward movement, therefore, of the punch and holder within the sleeve 45 is determined by the length of the flattened section

47. A handle or pressure applying member 48 is also provided which is fixed on the punch holder by means of a set screw 49.

Located around the punch 39 and bearing on a shoulder 50 on the punch holder 40 and a shoulder 51 on the sleeve 45 is a tensioning spring 52. The spring 52 determines the amount of compression given to the spiral. At the lower end of the sleeve 45, an annular shoulder 53 is provided which is adapted to fit the upper surface of the metal washer 28. It will, therefore, be seen that any downward motion given to the handle 48 will be transmitted through the punch holder 40, the shoulder 50, the spring 52, the shoulder 51, and the shoulder 53 to the washer 28 and the spiral 16. Since the spring 52 forms a part of this linkage, it will be evident that the amount of compression which can be transmitted to the washer 28 will be determined by the resiliency of the spring and will always be a substantially fixed amount, since after the spring has been compressed a definite distance, the pin 46 will reach the upper end of the flat portion 47, and further movement of the handle 48 to move the punch 39 downwardly will not impart any additional compression to the spiral 16. Movement of the punch 39 downwardly will force the section 41 into the runner tube, and will offset the ears 26 and 27 on the runner tube from the position shown in Fig. 3 to the position shown in Fig. 4. After this action has taken place, the compressing tool is then released, but the compression given to the spiral and transmitted through the spring 52 is retained therein by the offset ears 26 and 27. The ears in offset form and the upper spiral assembly are shown in detail in Figs. 6 and 7.

The function of the reduced section 43 during the movement just hereinbefore described is to act as a guide for the punch proper. Because of the guiding action of the punch, and the presence of the cushioning member 33, it is desired to point out that in accordance with the present invention the tendency of the runner tube to bend is inhibited irrespective of the amount of compression imparted to the spiral.

In previous methods hereinbefore employed, it has always been necessary for the operator to first locate or aline the groove between the ears with the offsetting tool. In accordance with the present invention, however, all that is necessary is to place the pencil mechanism with the tip in the seat or recess 38 and the runner tube around the guide pin or reduced portion 43, and then proceed to compress the spiral 16, and offset the ears 26 and 27. This has resulted in a material saving and an increase in production in an amount ranging between 35 and 50%.

It is further desired to point out that the supporting bushing 37 for the bottom of the pencil is normally centered below the die member so that when the pencil is placed in the bushing 37 it will extend upwardly and be centered by the bushing and the portion 43 of the die member.

It is desired to point out also that the amount of compression imparted to the spiral does not depend on the distance which the sleeve 45 and the shoulders 53 travel but on the strength of the spring 52 and the telescoping distance between the sleeve 45 and the punch as determined by the length of the flat portion 47.

What is claimed is:

1. A die member for compressing the spiral of a mechanical pencil on a runner tube provided with distortable ears comprising a telescoping die having a portion for compressing said spiral, a second portion movable relative to the first portion for distorting said ears to maintain the spiral in compressed condition, and a spring between the two portions adapted to determine the amount of compression imparted to said spiral by the first portion prior to the movement of said second portion to distort the said ears.

2. A die member for compressing a spiral on a runner tube provided with distortable ears comprising a telescoping die having a guide portion adapted to enter said runner tube, a second portion for compressing said spiral, a third portion movable relative to said second portion for distorting said ears to maintain the spiral in compressed condition, and a resilient support for the lower end of said spiral and runner tube to prevent damage thereto during compression.

3. In a tool for compressing and assembling the spiral of a mechanical pencil, with a runner tube held in a conical tip, a supporting bushing member having a recess in the upper portion thereof shaped to receive and center said tip, a die member centered above said bushing and spaced therefrom including a telescoping die having a portion for compressing said spiral and a second portion movable relative to the first portion for distorting the upper end of said runner tube to maintain the spiral in compressed condition.

4. In a tool for compressing and assembling a spiral of a mechanical pencil, with a runner tube held in a conical tip, said runner tube having a bifurcated upper portion, a supporting bushing member and a recess in the upper portion thereof shaped to receive and center said tip and a die member spaced from said bushing and comprising a telescoping die having a portion for compressing said spiral, a second portion movable relative to the first portion for bending the upper end of said runner tube to maintain the spiral in a compressed condition, a spring between the two die portions and means to limit the relative movement between the first and second die portions to determine the amount of compression imparted to said spiral.

5. A die member for compressing and assembling a spiral of a mechanical pencil with a relatively stationary portion of said pencil comprising means to support the stationary portion of said pencil and one end of said spiral, a die movable relative to said supporting means and having a first portion positioned to compress said spiral upon movement of said die toward said supporting means, and a second portion telescopically arranged for limited movement relative to said first portion and positioned to distort a distortable member on the stationary portion of said pencil to maintain said spiral in compressed condition when said second portion is moved toward said supporting means.

6. A die member for compressing a spiral of a mechanical pencil on a runner tube provided with a distortable member for maintaining said spiral in compressed condition, comprising means to support the runner tube and one end of said spiral, a die movable relative to said supporting means and having a first portion positioned to compress said spiral upon movement of said die toward said supporting means, a second portion telescopically arranged for limited movement relative to said first portion and positioned to distort said member on said runner tube when said second portion is moved toward said supporting means, and a guide portion on said sec-

ond portion positioned to enter said runner tube upon movement of said die toward said supporting means.

7. A die member for compressing a spring member upon a stationary member provided with distortable means for retaining the spring member in compressed condition comprising a support for one end of said spring and stationary member, and a die movable toward said support, said die comprising a first portion provided with an annular shoulder fitting the end of said spring remote from said support, a second portion slidably mounted within said first portion having a punch member adjacent its lower end positioned to contact and distort said distortable means as said second portion is moved toward said support, a spring between said two portions to move one portion from the other portion, said spring being compressed to allow relative movement of said portions, and means to limit the relative movement of said two portions.

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