Aug. 18, 1942. J. W. PARA 2,293,622

MECHANICAL PENCIL

Filed Sept. 10, 1940 2 Sheets-Sheet 1

FIG. 1.

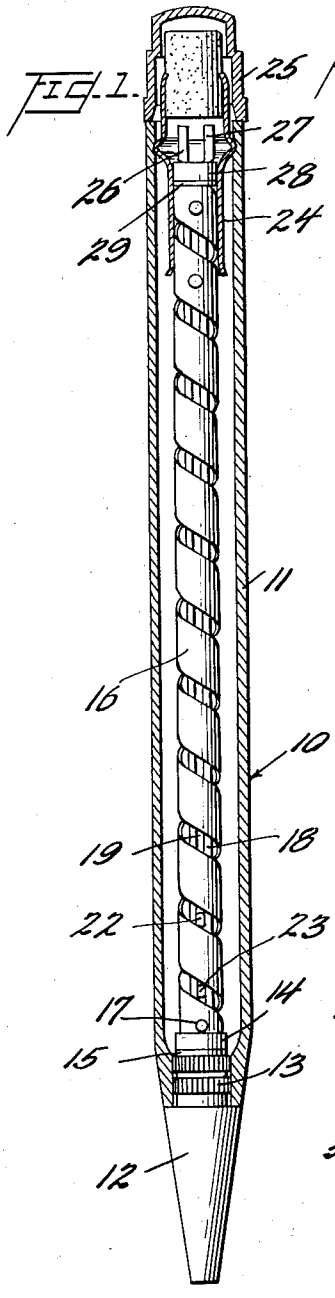


FIG. 2.

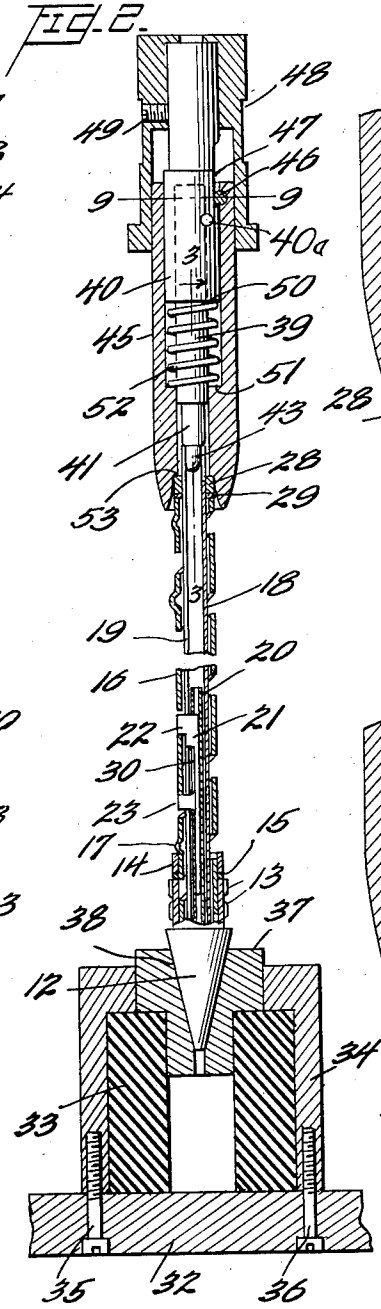


FIG. 3.

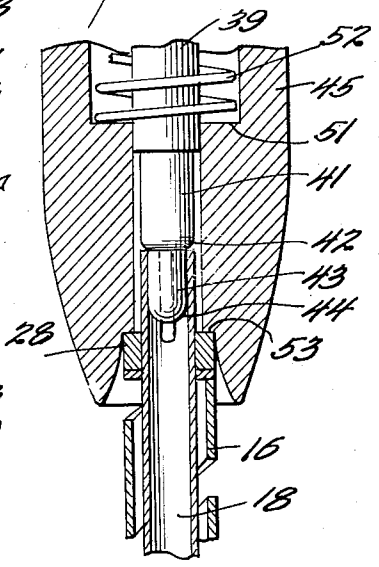
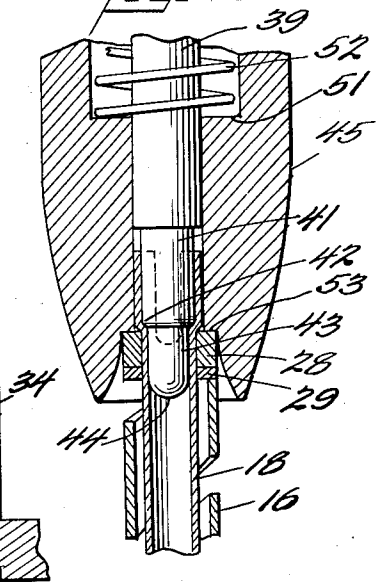


FIG. 4.



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MECHANICAL PENCIL

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FIG. 10.

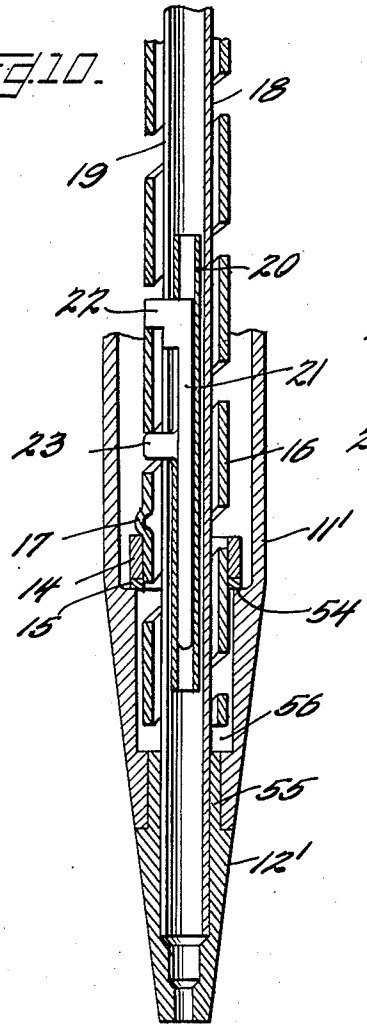


FIG. 7.

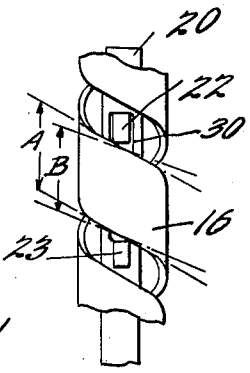


FIG. 8.

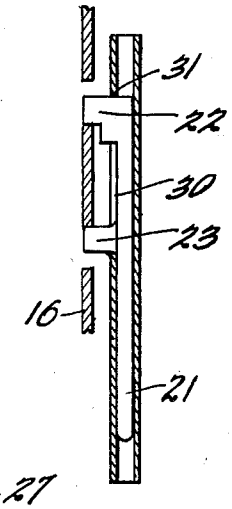


FIG. 6.

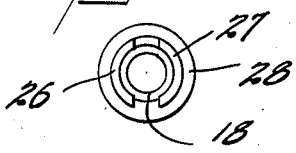


FIG. 5.

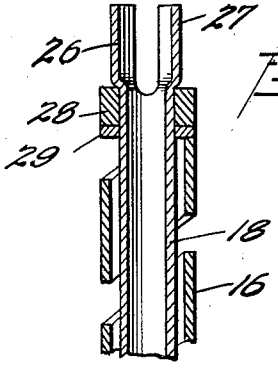
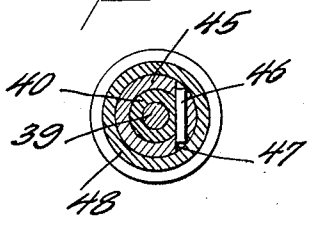


FIG. 9.



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UNITED STATES PATENT OFFICE

2,293,622

MECHANICAL PENCIL

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Application September 10, 1940, Serial No. 356,235

10 Claims. (Cl. 120—18)

The present invention relates to a mechanical pencil.

More particularly, the present invention relates to a mechanical pencil of the screw type which is provided with a rotating screw or spiral and a novel method of assembling the pencil.

A pencil of the character referred to consists in general of a writing spiral or a screw and a stationary longitudinally slotted runner tube. Positioned between the convolutions of the spiral and in the runner tube slot are a pair of lugs carried by the members of the pencil which serve to carry and eject the lead. The motion of the lead is in general produced by the relative motion of the spiral and the runner tube. A pencil of this character is more completely described, and certain of the elements thereof claimed in the co-pending application of Julius M. Kahn and John William Para, Serial No. 329,958, filed April 16, 1940.

It has been found desirable in pencils of this character to provide some means of maintaining the actuating spiral under a certain amount of spring tension or compression in order to prevent the easy movement or rotation of the spiral relative to the runner tube. If this tension is not present in the pencil, then upon writing it is possible for the pressure supplied to the lead to cause a movement of the spiral. Although previous types of pencil mechanism have depended upon friction of the various parts to prevent this phenomena, it has been discovered that after the pencil has been in use for any length of time, this friction is largely absent and it then becomes difficult to use the pencil, since the lead continually retracts into the pencil mechanism during writing and under the pressure of the lead on the paper.

Although the use of a compressed spiral is thus desirable, it has been found very difficult in actual practice to impart this compression to the spiral in a convenient and economical manner. It has also been found difficult to measure the amount of compression which is imparted to the spiral, and this last is important and critical, inasmuch as compression of the spiral changes the effective distance between the convolutions thereof, and unless the compression is limited and measured, the proper fitting of the various elements is thus prevented.

It is one of the objects of the present invention, therefore, to provide a novel method of assembling a mechanical pencil of the type described with the spiral under a constant predetermined pressure.

Another object of the present invention is to provide a mechanical pencil with a spiral having a predetermined amount of tension and a novel means for retaining this tension in the spiral after assembly.

A third object of the present invention is to provide a relatively simple, convenient and practical method of assembly of a spiral with the remaining elements of a mechanical pencil, while preventing any damage or twisting to the spiral or the remaining elements.

A fourth object of the present invention is to provide the runner tube of a mechanical pencil of the character described with a fastening means for the spiral on the runner tube which is capable of retaining the spiral in a tensioned or compressed form.

A fifth object of the present invention is to provide in a mechanical pencil a novel supporting means for the lower end of the spiral.

Other objects and advantages of the present invention will become apparent from the specification and drawings wherein:

Figure 1 is an assembled view of a mechanical pencil according to the present invention partly in section;

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

Fig. 3 is a section taken on the line 3—3 of Fig. 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 Fig. 2;

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

Fig. 5 is a section of the upper portion of a pencil runner tube and spiral in assembled position.

Fig. 6 is a plan view of the assembly of Fig. 5;

Fig. 7 is a partly diagrammatic detail of the spiral, lead carrier and ejector of the pencil according to the present invention;

Fig. 8 is a diagrammatic section of a portion of the spiral, lead carrier and ejector;

Fig. 9 is a horizontal section taken on the line 9—9 of Fig. 2;

Fig. 10 is a vertical section of a lower portion of a pencil having modified supporting means for the lower end of the spiral.

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 ex-

tension 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. 5. 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 assembled 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 once again to the co-operation of the lugs 22 and 23 with successive convolutions of the spiral, Fig. 7 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 once again to Figures 7 and 8, 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 9, 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. 9. 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 will move the punch 39 downwardly. 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. 5 and 6.

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 33 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%.

In Fig. 10, there has been illustrated a modified form of pencil wherein the lower portion of the spiral bears by means of the projection 17, and through the washers 14 and 15 on a shoulder 54 formed within a modified barrel 11'. As shown in this figure, the modified tip 12' is provided with a relatively small reduced portion 55 which may be provided with ribs for firmly retaining the same in the barrel 11'. The runner tube 18 in this modification is also firmly fastened to the tip 12' in any suitable manner. It will be seen that in this type of pencil a space 56 is provided underneath the spiral 16 without the necessity of extending the tip in the portion 13 or providing a bore within the tip. During assembly of a pencil of this character, therefore, the spiral will be tensioned and held in tensioned position between the shoulder 54 of the barrel and the ears 26 and 27 which, as may be understood, are also provided on the runner tube 18 of this modification.

The type of pencil just previously described and shown in Fig. 10 is more completely described and claimed in copending application Serial No. 361,953. The tool for compressing the spiral of the pencil forming the subject-matter of the present application is shown and claimed in divisional application Serial No. 396,634.

What is claimed is:

1. In a mechanical pencil, a runner tube, a spiral having spaced convolutions and movable relative to said runner tube, lead carrying and ejecting means, means on said lead carrying and ejecting means cooperating with spaced portions of the spiral convolutions and fitting snugly thereagainst when said spiral is in compressed condition, and fitting tightly against said spiral when the same is in normal condition, and means on said runner tube to retain said spiral in a compressed condition.

2. In a mechanical pencil, a tip, a runner tube having one end fixed in said tip, an actuating spiral surrounding said runner tube, means rotatably supporting the actuating spiral on the runner tube, and other means on said runner tube at the end remote from the tip, and engaging the corresponding end of the actuating spiral, said actuating spiral being held between the first and second means in a predetermined longitudinally compressed condition.

3. In a mechanical pencil, a tip, a runner tube having one end fixed in said tip, an actuating spiral on said runner tube, means adjacent the tip rotatably supporting the actuating spiral on the runner tube, a second means mounted on the runner tube at the end remote from the tip and engaging the corresponding end of the actuating spiral, a pair of offset ears on said runner tube cooperating with said last mentioned means to hold the actuating spiral in longitudinally compressed condition, lead carrying and ejecting means, and means on said lead carrying and ejecting means cooperating with spaced portions of the convolutions of said spiral and fitting snugly thereagainst when said spiral is in compressed condition.

4. In a mechanical pencil, a spring actuating spiral having spaced convolutions, a lead carrier having a lug between a first pair of convolutions of the spiral and an ejector having a lug between a second pair of convolutions of the spiral spaced from the first mentioned pair of convolutions, means to limit the separatory movement of said lugs to an amount slightly less than the normal distance between the pairs of spaced convolutions of the spiral with which said lugs cooperate, and means to maintain the spiral under compression to lessen the distance between successive convolutions and permit relatively free movement of the lugs relative to the spiral.

5. In a mechanical pencil, a runner tube, an actuating spiral having spaced convolutions and movable relative to said runner tube, a lead carrier tube having a lug cooperating with said spiral, and a slot, an ejector telescopically arranged in said lead carrier tube and having a lug extending from said lead carrier slot, said lead carrier lug and ejector lug cooperating with oppositely directed slanting surfaces of said spiral, the length of said lead carrier tube slot being such that the maximum distance between said lugs produces a tight contact between the lugs and the surfaces of the spiral when the spiral is in normal condition, and means to retain said spiral in compressed condition to change the pitch of the slanting surfaces of said spiral and permit relatively free movement of said lugs.

6. A method of assembling a pencil mechanism including a spiral having spaced convolutions and

lead carrying mechanism having a plurality of lugs cooperating with said spaced convolutions, comprising assembling said lead carrying mechanism with the lugs in tight contact with the spiral convolutions while the spiral is in a normal condition, and compressing the spiral to change the spacing between successive convolutions to free said lugs, and finally retaining said spiral in compressed condition.

7. A method of assembling a pencil mechanism including a spiral having spaced convolutions, a distortable portion adapted to retain said spiral in position and lead carrying mechanism having a plurality of lugs cooperating with said spaced convolutions, comprising assembling said lead carrying mechanism with the lugs in tight contact with the spiral convolutions while the spiral is in normal condition, compressing said spiral to change the spacing between successive convolutions to free said lugs, maintaining said spiral in compressed condition, and then distorting said distortable member to retain said spiral in compressed condition.

8. In a mechanical pencil including a tip member, a runner tube, an actuating spiral having spaced convolutions and movable relative to said runner tube, a lead carrier tube having a lug cooperating with said spiral, and a slot, an ejector telescopically arranged in said lead carrier tube and having a lug extending from said lead carrier slot, said lead carrier lug and ejector lug cooperating with oppositely directed slanting surfaces of said spiral, the length of said lead carrier tube slot being such that the maximum distance between said lugs produces a tight contact between the lugs and the surfaces of the spiral when the spiral is in normal condition, means adjacent said tip member rotatably supporting said spiral, and other means on said runner tube at an end thereof remote from the tip member and engaging the corresponding end of the actuating spiral, said spiral being held between the first and second means in a predetermined longitudinally compressed condition sufficient to change the pitch of the slanting surfaces of said spiral and permit relatively free movement of said lugs.

9. In a mechanical pencil including a tip member, a runner tube, an actuating spiral having spaced convolutions and movable relative to said runner tube, a lead carrier tube having a lug cooperating with said spiral, and a slot, an ejector telescopically arranged in said lead carrier tube and having a lug extending from said lead carrier slot, said lead carrier lug and ejector lug cooperating with oppositely directed slanting surfaces of said spiral, the length of said lead carrier tube slot being such that the maximum distance between said lugs produces a tight contact between the lugs and the surfaces of the spiral when the spiral is in normal condition, means adjacent the tip member rotatably supporting the actuating spiral, a second means on said runner tube at the end thereof remote from the tip and engaging the corresponding end of the actuating spiral, and a pair of offset ears on said runner tube cooperating with said last mentioned means to hold the actuating spiral in longitudinally compressed condition to change the pitch of the slanting surfaces of said spiral and permit relatively free movement of said lugs.

10. A method of assembling a pencil mechanism including a spiral having spaced convolutions, a distortable portion adapted to retain said spiral in position, and lead carrying mechanism having a plurality of lugs cooperating with said spaced convolutions comprising assembling said lead carrying mechanism with the lugs in tight contact with the spiral convolutions while the spiral is in normal condition, supporting the lower end of said spiral and moving the upper end of the spiral downwardly to compress the same to change the spacing between successive convolutions to free said lugs, and then distorting said distortable member to retain the upper end of the spiral in compressed condition.

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