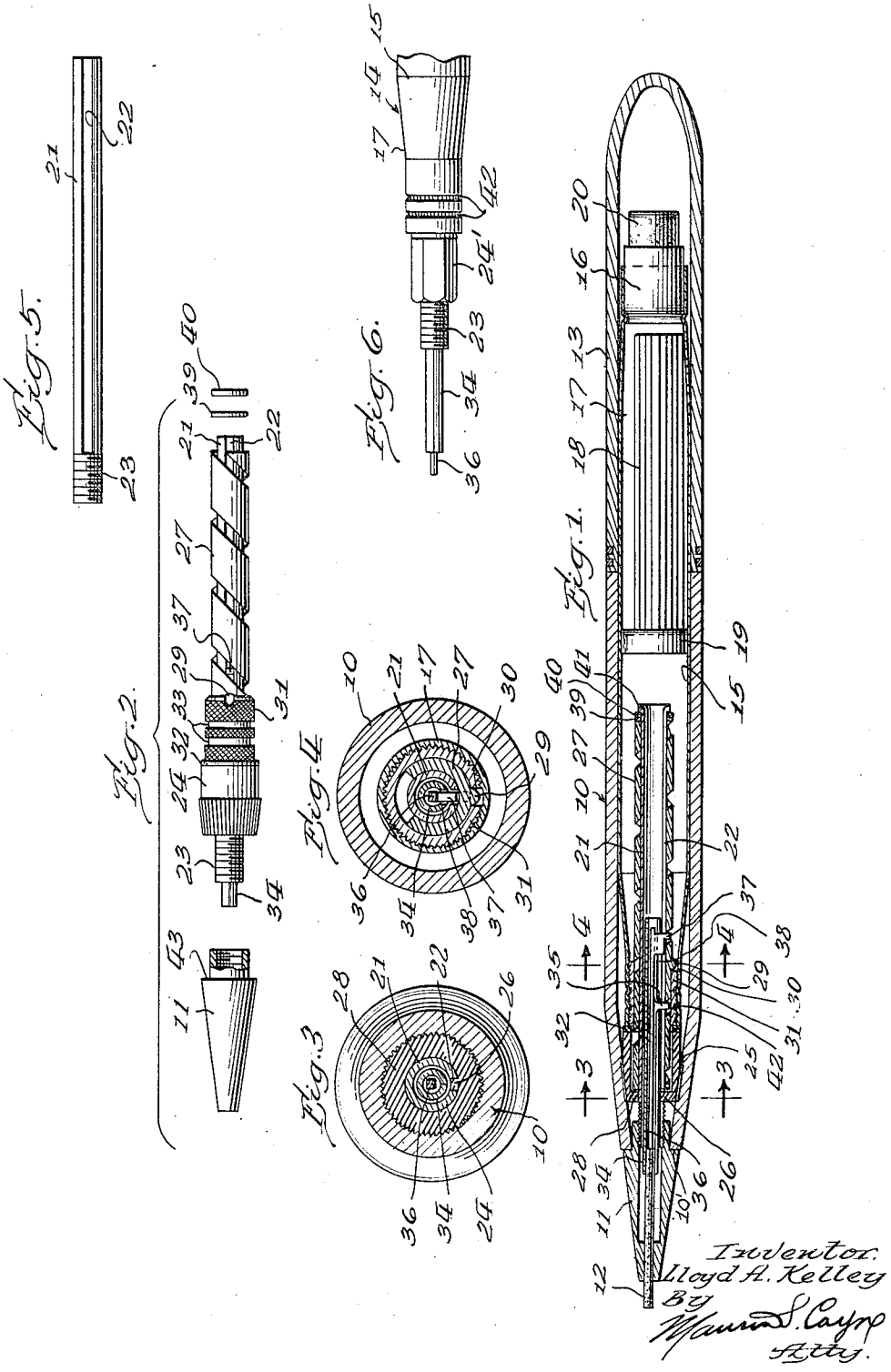
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MECHANICAL PENCIL

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MECHANICAL PENCIL

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This invention relates to mechanical pencils and more particularly to a pencil having what is known in the trade as a "back action."

"Back-action" refers to the manner in which the mechanism causes reciprocal motion of the lead. As opposed to procuring the required propulsion or the like by twisting the tip end of the pencil, motion of the lead is obtained in my pencil by twisting or rotating the end of the pencil opposite to the writing end or tip.

The disadvantages of previous back-action mechanisms has been the amount of parts necessary and especially the difficulty in assembly. In assembling all pencils of this type it has been heretofore necessary to permanently fix the operating parts within the pencil casing. Hence, in adjusting or repairing, the entire pencil had to be forcibly taken apart with consequent breakage and deformation of parts.

In assembling previous pencils, no provision was made to compensate for the gradual release of tension in the mechanism as caused by the wear of parts, or to adjust said tension if varied for any other reason.

An object of this invention is to provide a mechanical pencil having a back-action movement in which the operating tension of the mechanism may be adjusted to compensate for wear or to otherwise vary said tension.

Still a further object of the present invention is to provide means whereby the operating tension of a mechanical pencil may be quickly adjusted by a simple operation without necessitating disassembly of the pencil.

Another object of this invention is to provide a back-action mechanical pencil in which the parts will be adapted for economical and efficient assembly and production in large quantities.

Another object of this invention is to provide a movement for a mechanical pencil which may be removably installed in a pencil casing with extreme ease.

Still a further object of this invention is to provide a simple back-action pencil movement which will eliminate many parts heretofore needed to construct pencils of this type, and which will thereby enable ease and economy of repair.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel features of construction, arrangement and combination of parts hereinafter fully described, illustrated in the accompanying drawing, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportion, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

For the purpose of facilitating an understanding of my invention, I have illustrated in the accompanying drawing a preferred embodiment thereof, from an inspection of which, when considered in connection with the following description, my invention, its mode of construction, assembly and operation, and many of its advantages should be readily understood and appreciated.

Referring to the drawing in which the same characters of reference are employed to indicate corresponding or similar parts throughout the several figures of the drawing:

Fig. 1 is a median sectional view of a pencil embodying my invention, some of the parts being in elevation.

Fig. 2 is an elevational view of some of the parts of the propulsion movement of my pencil.

Fig. 3 is a sectional view through the pencil taken along the line 3—3 of Fig. 1.

Fig. 4 is a sectional view through the pencil taken along the line 4—4 of Fig. 1.

Fig. 5 is an elevational view of a part of the mechanism.

Fig. 6 is an elevational view of the forward portion of the completed operating unit of my pencil, showing slight modification in one of the parts thereof.

Generally stated, the invention resides in a pencil mechanism which is completely assembled with the proper tension in its parts (that is, requiring a predetermined force to move one operating part relatively to the other) before being placed in its pencil casing, and then, after assembly within the casing, additional tension may be applied to the mechanism by means of tightening the tip of the pencil, to either take up wear of the parts, or to make the tension between the moving parts greater than normal.

The method of operation of a pencil of this type and many of its constructional features are well known and not intended to be claimed. By this statement reference is had to the manner of causing a spiral tube and a slotted channel to be concentrically associated therewith to rotate relative to one another and thereby cause reciprocal motion of an assembled collet and push pin disposed within the channel tube and having portions thereof riding in the slot of the chan-

nel tube and projecting into the groove of the spiral tube.

Further, the means whereby the collet and push pin move relative to one another at the forward limit of collet motion to thereby expel the last fragment of writing lead disposed in the collet is believed to be old and well known, and not requisite of detailed explanation.

Referring to the figures, the character 10 designates generally a pencil casing of any suitable material having its forward portion tapered to meet a metallic hollow tip 11 through which a stick of graphite or pencil lead 12 is adapted to protrude in the well known manner. The upper portion of the pencil consists of a cap 13 meeting the casing flush intermediate of the ends of the pencil.

Disposed within the pencil is an assembled unit designated generally as 14 and consisting of a tubular member 15, known as an operating tube, having the major portion of the operating mechanism received at one end thereof as will be described, an eraser member 16 inserted in the opposite end thereof, and providing a reservoir 17 for the storage of leads 18 by means of a blocking member 19 provided internally thereof. The cap 13 is of such internal diameter as to frictionally engage the tubular member 15 so that rotation imparted to the cap 13 will cause rotation of the member 15. At the same time the friction is not so great as to prohibit ready removal of the cap to permit access to the eraser 20 and if desired, the reservoir 17.

The forward end of the tubular member 15 is constricted or tapered as shown at 17 and has the feeding mechanism generally shown in Fig. 2 fixedly attached thereto in a manner to be presently described. A second portion of the feeding mechanism is removably fixed to the casing 10 in a manner to be described. Hence, it will be seen that as the cap 13 is rotated relative to the casing 10, the feeding mechanism will operate.

Fig. 5 shows a channel tube 21 having a longitudinal slot 22 stopping short of a threaded end 23. The central tubular passage of said tube 21, however, extends through the threaded portion 23 of the channel tube as well as the body thereof. Disposed upon this tube 21 is a collar or sleeve 24 having a serrated outer surface. The serrations of this surface are adapted to engage with correspondingly matched serrations 25 provided internally of the casing 10 at the tapered portion thereof, thereby preventing relative rotation between casing 10 and collar 24 when the sleeve is engaged therewithin as shown in Fig. 1. The collar 24 is provided with a key 26 engaging the slot 22 and thereby preventing relative rotary motion between the channel tube 21 and the collar member 24 or the casing 10.

I have found it at times convenient to provide the inner surface of the casing at 25 with a non-circular geometrical configuration instead of a serrated configuration. To match this, of course, it is desirable that the outer surface of collar member 24 be provided with a conformingly shaped geometrical configuration. In Fig. 6, for example, I have shown such collar 24' shaped with hexagonal cross-section.

A spiral tube 27 formed of metal ribbon or the like is rotatably disposed upon the channel tube 21, having an end thereof disposed within the collar 24. Said collar has an end wall 28 which is provided with an opening sufficiently large to snugly pass the slotted portion of the channel tube 21, being further provided with the previously referred to key 26 to engage said slot 22. The inner diameter of the collar 24 is sufficient to loosely accommodate the end of the spiral tube 27.

Intermediate the ends of the spiral tube 27 I provide a sleeve member 31 which is fixedly secured to said tube by means of a projection 29 which engages a slot 30 provided therefor in one end of said sleeve 31. It will be noted from this that the sleeve will rotate with the spiral tube 27. The disposition of the sleeve 31 upon the tube 27 is closer to the forward end thereof, i. e., the left end as viewed in the figures. When the device is assembled, in a manner to be explained below, the spiral tube 27 is compressed within the collar 24 and since the diameter of the sleeve 31 is approximately the same as that of the collar, it will be caused to bear against the free end of the collar 24. In the operation of the pencil, when the spiral tube 27 and the channel tube 21 are rotated relative to one another, the juxtaposed surfaces of the collar 24 and the sleeve 31 will engage and bear one against the other. A fibre washer 32 is interposed between said collar and sleeve to prevent squeak and wear of the parts, one on the other, and to promote ease of relative motion.

The sleeve member 31 is knurled throughout its entire length as shown, and is provided with a pair of annular grooves 32 for a purpose to be described hereinafter.

Internally, the channel tube 21 is provided with the split tube collet 34 which is provided with a projection 35 which extends through the slot 22 of channel tube 21 and engages and rides within the groove of the spiral tube 27. Within the collet 34 a push pin 36 is loosely disposed. Said push pin has a lateral extension 37 which extends through a slot 38 of the collet, through the slot 22 and is adapted to engage and ride within the groove of the spiral tube 27 with a turn of the helix separating it from the projection 35. As the channel tube 21 is rotated relative to the spiral tube 27 the collet 34 and push pin 36 will move towards the point end of the pencil, thereby propelling forward the lead 12 which has its end inserted in the collet.

As the projection 35 reaches the limit of its movement, namely the wall 28, the lateral extension 37 continues movement along slot 38, thereby causing movement of the push pin 36 relative to the collet 34. Consequently, the end of the pin 36 will move out of the collet end as shown in Fig. 6, thereby expelling the last fragment of lead.

In assembly of the pencil, the unit 14 is completely assembled before being associated with the pencil. This, of course, is a feature of my invention which promotes so called mass production thereof. The relatively rotatable parts of the mechanism are assembled with a predetermined tension therebetween. That is, the spiral tube 27 is provided with an initial compression during manufacture which controls the ease with which the parts are movable relative to one another. The channel tube 21 is inserted in the collar 24, the spiral tube 27 and its sleeve 31 are inserted in the collar 24 and over the channel tube 21 with the washer 32 in place, and the collet 34 and its push pin 36 are inserted. With the parts in this state of loose assembly, as shown in Fig. 2, fibre washer 39 and metal washer 40 are respectively slipped over the end of the channel tube 21, engaging against the

end of the spiral tube 27. The spiral tube 27 is compressed against the upper end of the collar 24 by way of the sleeve 31 and the washer 32 until a desired amount of compression is applied to said spiral tube 27. Then the end of the channel tube 21 is feathered as shown in Fig. 1 at 41 to permanently bind said washers 39 and 40 in position against the spiral tube 27 and thereby maintain the compression applied, between the washers 39 and 40 and the collar 24. Thus an initial tension between the relative moving parts of the mechanism is provided.

With the mechanism of the unit assembled thus far, the tapered end 17 of the tubular member 15 is snugly fitted over the knurled sleeve 31 and is spun or in other manner fixedly secured thereto. I prefer knurling the end 17 into the annular grooves 33 with single lines of knurling 42 as shown in Fig. 6.

It will be noted that the operating unit 14 of the pencil is now completely assembled and is ready to be installed in any suitable pencil casing. Such units may be made in large quantities and independently of the pencil casing. This is a feature of the invention since it eliminates the performance of assembly operations upon the mechanism with the pencil casing in place. Special tools and jigs are thereby eliminated. The unit may be adapted to installation in any desired shape of pencil casing by mere variation of the shape of the collar 24 or length of the threaded portion 23.

In installing such a unit 14, as described, in the pencil casing 10, the forward threaded end 23 of the unit is inserted into the casing 10 so that the serrated collar 24 engages the grooves 25 provided therefor in the internal surface of the casing at the forward tapered portion thereof. The tip 11 of the pencil is provided with internal threads adapted to engage the portion 23 and is further provided with a shoulder 43 which is adapted to engage the end 10' of the casing. The taper of the tip is such as to cooperate with the tapering portion of the casing 10 and thereby become substantially flush therewith and present a smooth surface upon assembly.

It will be noted that the collar 24 is disposed within the casing a distance from the end 10' of said casing 10. Thus the unit 14 is suspended within the casing more or less spaced from the end 10' thereof. When the tip 11 is screwed home upon the portion 23, the shoulder 43 will engage the end 10' and the portion of the casing between the end 10' and the collar 24 will space the tip from the collar. As the tip is tightened upon the threaded end 23 of the channel tube 21, it tends to decrease the distance between the collar 24 and the tip 11. However, the casing prevents the distance from decreasing, hence a great force is exerted longitudinally of said channel member 21. This force is transmitted through the channel tube 21 to the washers 39 and 40 and is applied thereby to the end of the spiral tube 27, further compressing same by way of the sleeve 31 against the end of the collar 24 through the washer 32.

Thus it is seen that by means of the tip, a simple operation will add to the compression of the spiral tube 27, even though same has been initially compressed, thereby increasing the tension between the relatively movable parts of the pencil. This feature permits the user to adjust the tension to suit himself, permits ready tightening of the mechanism during repair, and permits a maintenance of tension throughout the life of the pencil as the parts thereof cause wear and subsequent release of compression of the spiral tube 27.

Propulsion of the lead is obtained by causing reciprocal movement of the collet. This is effected by moving the cap 13 of the pencil relative to the casing 10. In final analysis this motion causes relative motion between the sleeve 31 (including the spiral tube 27 and the operating tube or tubular member 15 which is frictionally attached to the cap 13) and the collar 24 (fixed to and including the casing 10, the channel tube 21, and the tip 11).

It will be seen that I have provided a mechanical pencil which has as a feature, among others, of its construction, means whereby although the mechanism has been initially tensioned during the manufacture thereof, after the installation into a pencil casing it may be further tightened and adjusted as desired by a simple operation of the user, namely the screwing up of the tip of said pencil.

It will further be seen that I have described a construction for a pencil mechanism capable of being manufactured independently of the pencil casing and hence capable of being installed in practically any desired type of pencil casing, thereby making the mass manufacture and assembly of such pencils more efficient and economical.

It is believed that my invention, its mode of construction and assembly, and many of its advantages should be readily understood from the foregoing without further description, and it should also be manifest that while a preferred embodiment of the invention has been shown and described for illustrative purposes, the structural details are nevertheless capable of wide variation within the purview of my invention as defined in the appended claims.

What I claim and desire to secure by Letters Patent of the United States is:

1. A pencil comprising an operating tube, a casing mounted thereon and rotatable relative thereto, feeding mechanism comprising two relatively rotatable parts, one within the other, one of said parts being attached to said casing and the other of said parts being attached to said tube, said last mentioned part including a longitudinally compressed spiral member, said first part being provided with means for maintaining a state of longitudinal compression in said spiral member, said means cooperating with said casing and being operable for actuating said first mentioned part relative to said second part for varying the compression of said spiral member.

2. A pencil comprising an operating tube, a casing mounted thereon and rotatable relative thereto, feeding mechanism comprising two relatively rotatable parts, one within the other, one of said parts being attached to said casing, the other of said parts being attached to said tube, said last mentioned part including a longitudinally compressed spiral member, said first part having means associated therewith for maintaining the initial compression of said spiral member and means movable upon and longitudinally of said first part cooperating with said casing to vary the initial compression of said spiral member after said parts have been assembled with said casing.

3. A pencil comprising an operating tube, a casing mounted thereon and rotatable relative thereto, feeding mechanism comprising two relatively rotatable parts one within the other, one

of said parts being attached to said casing, the other of said parts being attached to said tube, said last mentioned part including a longitudinally compressed spiral member, said first part having means associated therewith for maintaining the initial compression of said spiral member and means cooperating with said casing to vary the initial compression of said spiral member after said parts have been assembled with said casing, said means comprising a member detachably secured to said first part, and adapted to engage a portion of said casing and movable to exert pressure against said casing to cause said first part to move relative to said compression means thereby increasing the compression of said spiral member.

4. A pencil comprising an operating tube, a casing mounted thereon and rotatable relative thereto, feeding mechanism comprising two relatively rotatable parts, one within the other, one of said parts being attached to said casing, the other of said parts being attached to said tube, said last mentioned part including a longitudinally compressed spiral member, said first part having means associated therewith for maintaining the initial compression of said spiral member and means cooperating with said casing to vary the initial compression of said spiral member after said parts have been assembled with said casing, said compression means including a collar non-rotatably mounted upon said first mentioned part but movable longitudinally thereof, said collar being secured to said casing thereby holding one end of said spiral member in fixed relation with respect to said casing as pressure is being applied to said first part.

5. A pencil comprising an operating tube, a casing mounted thereon and rotatable relative thereto, feeding mechanism including a channel tube and a compressed spiral member rotatably mounted thereon, a member capable of motion longitudinally of said channel member and non-rotatively mounted thereon, said member providing connection between said channel member and said casing, means for securing said feeding mechanism in assembled operative relation within said casing and spaced from said connecting member by a portion of said casing, said last mentioned means also being operable to move said channel tube longitudinally relative to said spiral member and thereby increase the compression of said spiral member.

6. A mechanical pencil comprising a casing, and a feeding mechanism disposed therein, said mechanism including a pair of relatively movable parts, one within the other and initially tensed with respect to one another, means for maintaining said feeding mechanism in assembly as a unit and in a predetermined tensioned condition prior to its assembly to the casing, and means for securing said unit in assembled operative relation with said casing, said last mentioned means also being capable of operation to vary the tension of said mechanism after the assembly of said unit to said casing.

7. A mechanical pencil feeding mechanism capable of being assembled and maintained as a unit prior to its assembly to a pencil casing, comprising a pair of relatively movable parts, one within the other and initially tensed with respect to one another, one of said parts including a channel tube and the second of said parts including a spiral member disposed upon said channel tube, the relative tension between the parts being obtained by longitudinal compression of said spiral member, means for placing and maintaining said spiral member under compression, said last mentioned means serving to maintain the unit in assembly, an operating tube secured to said spiral member, and means for securing the entire unit in assembled condition within a pencil casing.

8. A mechanical pencil feeding mechanism capable of being assembled and maintained as a unit prior to its assembly to a pencil casing, comprising a channel tube and a spiral member rotatably mounted thereon, a collet and push pin assembled to reciprocate upon relative rotation between said tube and spiral member, a collar slidably mounted on said channel tube and non-rotatively fixed thereto, means for holding said channel tube, spiral member, collet and push pin, and collar in operative assembly with said spiral under longitudinal compression, an operating tube fixedly connected with said spiral tube, said collar being adapted to non-rotatively engage within said pencil casing, said mechanism adapted to be assembled as a unit with said spiral tube under a predetermined tension prior to installation thereof within said casing, and means for securing said unit in operative relation within a pencil casing.

9. A mechanical pencil feeding mechanism capable of being assembled and maintained as a unit prior to its assembly to a pencil casing, comprising a channel tube and a spiral member rotatably mounted thereon, a collet and push pin assembled to reciprocate upon relative rotation between said tube and spiral member, a collar slidably mounted on said channel tube and non-rotatively fixed thereto, means for holding said channel tube, spiral member, collet and push pin, and collar in operative assembly with said spiral under compression, an operating tube fixedly connected with said spiral tube, said collar being adapted to non-rotatively engage within said pencil casing, said mechanism adapted to be assembled as a unit with said spiral tube under a predetermined tension prior to installation thereof within said casing, and means for securing said unit in operative relation within a pencil casing, said last mentioned means comprising a screw member operably connected to said channel member spaced from said collar and adapted to be moved to increase the compression of said spiral member after the unit has been operably assembled within said casing.

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