

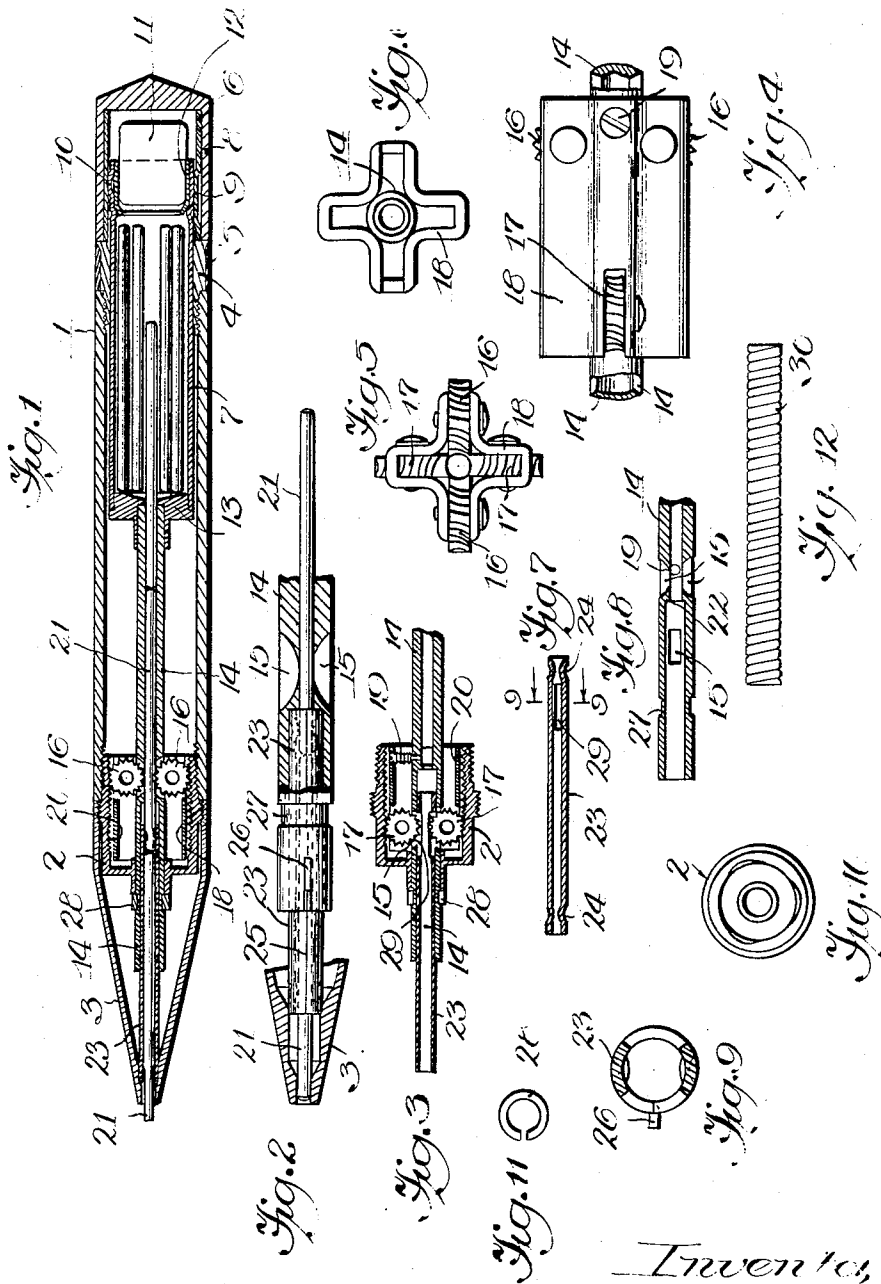
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PENCIL

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PENCIL

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This invention relates to improvements in mechanical pencils in which the lead may be advanced or retracted by rotating one part of the pencil with respect to another part.

One object of the invention is to provide an improved pencil in which the lead may be advanced or retracted to permit the desired adjustment of the part which projects from the tip of the pencil and in which successive lengths of lead may be fed toward said tip by positive means.

Another object is to provide a mechanical pencil having small gears engaging the lead to advance or withdraw it.

Another object is to provide a pencil of this character in which the lead as furnished may be provided with circumferential grooves to facilitate engagement by said gears and insure a positive feed.

A further object is to provide a mechanical pencil having a magazine with a funnel shaped outlet with means for guiding the lengths of lead between small gears whereby successive lengths of lead, either long or short, are delivered to said gears by gravity when the pencil is held in writing position.

An additional object is to provide a mechanical pencil having friction means between the feed gears and the tip of the pencil and actuated by said gears whereby even short lengths of lead may be partially retracted into the pencil tip.

A further object is to provide a mechanical pencil having worm gears therein engaging the lead between them to move it back and forth with a positive feed.

An additional object is to provide a pencil of this character having a thread within the barrel and means associated with the barrel for rotating the support for the gears to cause them to rotate about their axes while turning with their support.

An additional object is to provide a positive feed mechanical pencil having two sets of gears therein, in planes at right angles to each other arranged along the longitudinal axis of the pencil to engage successive lengths of lead and feed them toward the tip without breaking the leads.

A further object is to provide a mechanical pencil of generally improved construction.

In the accompanying drawing:

Fig. 1 is a longitudinal section of a pencil embodying my invention;

Fig. 2 is an enlarged elevation partly in section of certain parts near the tip of the pencil;

Fig. 3 is a partial section elevation of the support for the gears showing one pair of gears ar-

anged at right angles to the pair shown in Fig. 1;

Fig. 4 is an enlarged plan view of said gear support and gears therein;

Fig. 5 is an end view thereof;

Fig. 6 is a similar view with the gears removed;

Fig. 7 is a section of a tube having restricted ends to frictionally grip the lead;

Fig. 8 is a partial sectional view of a tube which overlies the same;

Fig. 9 is a section on the line 9—9 of Fig. 7;

Fig. 10 is an end view of a thimble containing the gear support and gears; and

Fig. 11 is an end view of a split locking ring.

Fig. 12 is an elevation of a lead having a helical thread thereon.

The casing or barrel 1 of the pencil is screw threaded at both ends and engages at one end a screw threaded sleeve or thimble 2, which is also engaged by the screw threaded end of the tip 3. The other end of the barrel is screwed over a sleeve 4, which latter is of less diameter than the metal band 5, which holds the usual clip. An inner sleeve 6 is fixed to a magazine 7 so as to rotate the latter when said sleeve is turned and thus actuate the positive feed device hereinafter described. The cap 8 is fixed to the sleeve 6 to rotate the same, having a pressed fit thereon.

The sleeve 6 has several struck in ribs 9, three in this instance, and the end of the magazine 7 has the same number of ribs 10 struck outwardly therefrom, so that when the cap 8 and its lining 6 are pressed into position longitudinally and rotated, the inwardly and outwardly projecting ribs engage and cause the magazine 7 to rotate with the cap. An eraser 11, is held within a cup 12, which is fitted in the open end of said magazine 7. The other end of said magazine has a head 13 with an end taper or funnel to guide the leads out of the opening therein. A tube 14 or magazine tube is connected to the head 13 and has two pairs of longitudinal slots 15 therein at right angles to each other as shown in Fig. 8.

These slots receive two pairs of skew gears or worm gears 16, 16 and 17, 17 mounted in a frame 18. The gears of each pair are arranged in the same plane and separated a distance approximately equal to the diameter of the leads to be used. The gears of one pair are mounted in the frame at right angles to the plane of the gears of the other pair, as shown in Fig. 5. The outer surfaces of the teeth of said gears represent substantially a cylindrical surface, i. e. said outer surfaces are substantially at right angles to the

side walls of said gears as viewed in said Fig. 5. Said frame rotates with the hollow shaft 14, being fastened thereto by a set screw 19. As the frame rotates, the worm gears engage threads 20 which are cut on the inner surface of the stationary sleeve 2, thus causing rotation of said gears about their respective axes while the gears as a group rotate around the longitudinal axis of the pencil. This causes the teeth on said gears to bite into the smooth cylindrical surface of the lead 21, through the openings 15 through which said gears project and feed the lead toward the tip of the pencil with a positive action. The arrangement and design of the gears is such that there is no danger of the leads binding or breaking as they are fed through the same. If the rotation of the cap 8 is reversed, the lead is moved in the opposite direction. It will be evident that instead of a pair of gears or toothed rollers, one on each side of the lead, one of said rollers may be provided with teeth and the other may have a smooth cylindrical or concave surface so that the lead will be held between the two rotatable members and positively moved in either direction by the toothed member.

The end of the tube 14 has an opening in it of larger internal diameter than the main bore at the point where the lead enters it, this enlarged bore terminating at the point 22. In this enlarged bore, fits a small tube 23 of a diameter to receive the lead and permit the same to slip freely through the same except at the two points 24, 24 where it is contracted to frictionally engage the lead. Said tube is split, as shown at 25 in Fig. 2 thus enabling it to exert a yielding pressure on the lead and it has a fin 26 thereon which fits in a slot in the end of the tube 14 to prevent relative rotation. Said tube 14, at the left hand end, has an annular groove 27 therein into which a ring 28 is snapped, to lock said tube against endwise movement with respect to the sleeve 2. Said tube 23, has a slot 29, therein, as shown in Figs. 3 and 7, to receive two of the gears.

In operating the device, rotation of the cap 8 causes rotation of all the parts within the outer casing except the sleeve 2 and at the same time the lead is fed forward. These leads are preferably in short lengths to fit the magazine, as is usual, and in the proportions shown in the drawing, are shorter in length than the distance from the tip of the pencil to the worm gears. Thus the lead which is being consumed during the writing operation is not gripped by any of the four gears but said gears grip the lead immediately behind the one being used and when the cap is rotated to feed forward the second lead, it pushes the first lead outwardly and in order to supply additional sections of lead all that is necessary is to hold the pencil more or less vertically, as in writing, whenever the cap is being turned to cause the lead in use to project further, and this will cause another or third lead from the magazine to drop in behind the second lead whenever there is sufficient clearance available. In the drawing one of the third leads is shown as having been partly fed into the tube 14 by gravity.

With the arrangement described, each lead is entirely consumed and the feeding forward of successive leads is continuous. Furthermore, if the lead in use projects too far, it may be retracted by reversing the direction of rotation of the cap and while the worm gears have no engagement with the lead in use they draw back the second lead, which is in frictional engage-

ment with the tube 23, by virtue of the innermost contracted end 24, thereby causing the outer of the two contracted ends 24 to draw back the lead which is in use.

Furthermore it will be noted that there is a positive feed for the leads, which are discharged from the magazine by gravity, regardless of the length of the lead and are guided to the feeding mechanism, the action being automatic. That is to say, in addition to the usual standard lengths of lead the pencil will operate satisfactorily with short broken pieces introduced into the magazine together with longer lengths and said leads, regardless of length, will find their way down the feed tube to the gears either when the pencil is held vertically or in inclined position, as in writing.

Although the lead 21 heretofore described is the usual one with a smooth cylindrical surface, it may be provided with circumferential grooves, either independent grooves or a continuous helical groove, as illustrated by the lead 30 shown in Fig. 12. With this arrangement the teeth of the gear will positively feed the lead forward without having to bite into the lead to secure a firm hold thereon.

I claim:

1. A pencil comprising a barrel having a helical thread in a non-rotatable part therein, a gear support in said barrel rotatable with respect to said barrel about the longitudinal axis thereof, a gear mounted in said support to turn on an axis transverse to said longitudinal axis with its teeth engaging said helical thread on one side and its other side adjacent said longitudinal axis, means for guiding a lead along said longitudinal axis whereby it may be engaged by the teeth of said gear and caused to protrude from the tip of said pencil and means at the other end of said pencil for rotating said gear support to cause said gear to move said lead longitudinally.

2. A pencil comprising a barrel having a gear support therein, two sets of gears displaced longitudinally on said support, a tube extending from near the tip of said pencil past one set of gears, a magazine tube in axial alignment with the other tube to guide short lengths of lead to said other set of gears, means for rotating said gears to feed the lead from said magazine tube into said other tube, said other tube being frictionally engaged by the lead fed from said gears whereby it may be moved thereby.

3. A pencil comprising a barrel having a tip at one end, two sets of gears therein for engaging the lead, means for rotating said gears to advance said lead toward said tip, a tube arranged within said barrel between said tip and the nearest set of gears, said tube having means for frictionally engaging the lead passing therethrough to cause it to move therewith whereby said tube and the lead therein may be advanced or retracted by the succeeding lead after the first lead has advanced beyond said gears.

4. A pencil as in the preceding claim wherein the means for frictionally engaging said lead comprises a constricted portion at each end of said tube.

5. A pencil as in claim 3 with the provision of a magazine tube through which the leads slide by gravity to said gears and means for preventing longitudinal movement of said tube with respect to said gears.

6. A pencil as in claim 3 with a removable cap at the other end of said barrel with means co-

operating with said gears to rotate the latter upon rotation of said cap.

5 7. In a lead pencil, an outer tube, a non-rotatable thimble secured to said tube and having a thread therein, a gear support within said thimble, two sets of worm gears mounted in said support to feed a lead through an opening in said thimble, each set consisting of two worm gears on axes parallel to each other and at right angles to the axes of said other set, said worm gears engaging said thread and means for causing relative rotation of said thimble and gear support.

10 8. A lead pencil as in the preceding claim, having a tube for the leads, contracted near each end, and an opening near one end to receive one set of worm gears.

15 9. A pencil comprising a barrel having a helical thread in a part thereof, a gear support in said barrel rotatable about the longitudinal axis thereof, a gear mounted in said support to turn on an axis transverse to said longitudinal axis with its teeth engaging said helical thread on one side and its other side adjacent said longitudinal axis, means for guiding a lead on said longitudinal axis
20 25 whereby it may be engaged by the teeth of said

gear, means for rotating said gear support to cause said gear to move said lead longitudinally and means between said gear and the pencil tip for frictionally gripping a length of lead at two points displaced longitudinally whereby two independent aligned lengths of lead may be retracted, one by said gear and the other by said friction means. 5

10 10. A mechanical pencil comprising a barrel, a gear support therein rotatable with respect to said barrel and having a central opening there-through, two pairs of gears carried by said support and displaced axially with reference to each other, the gears of each pair being mounted in the same plane and spaced sufficiently to receive and grip a lead between them, the said plane of mounting of one pair of gears being at right angles to that of the other pair, stationary means having a helical thread engaged by the outer portions of said gears, and means for rotating said support whereby the inner portions of said gears may feed said lead in one direction or the other, depending on the direction of rotation of said support. 15 20

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