July 26, 1932. C. R. KEERAN 1,869,198

MECHANICAL PENCIL

Filed July 2, 1929

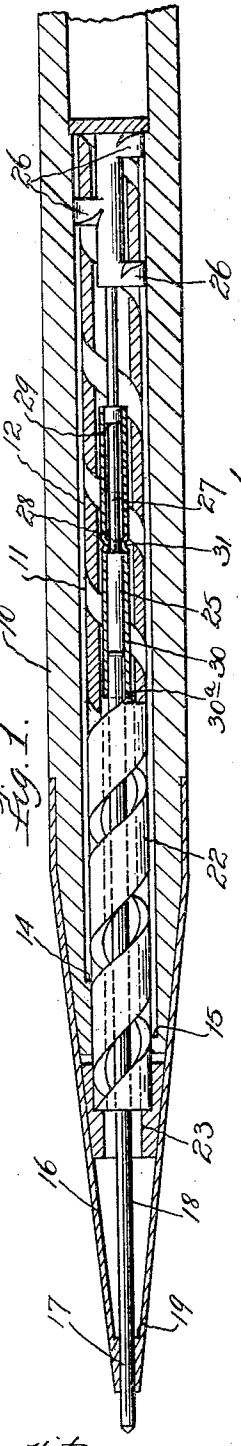


Fig. 1.

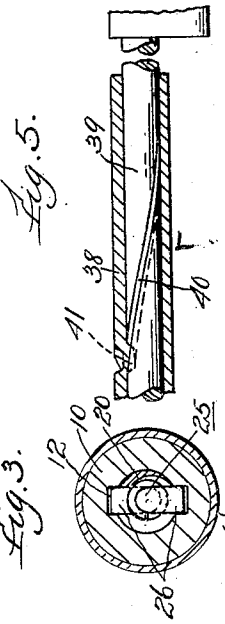


Fig. 3.

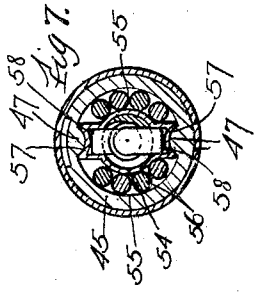


Fig. 7.

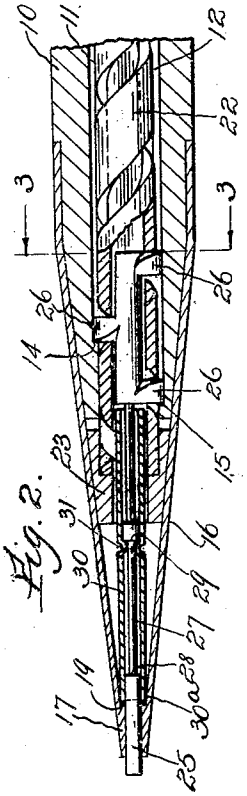


Fig. 2.

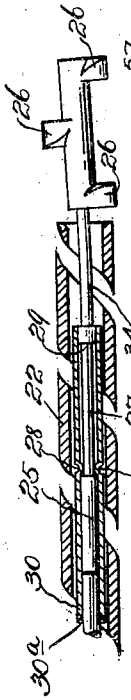


Fig. 4.

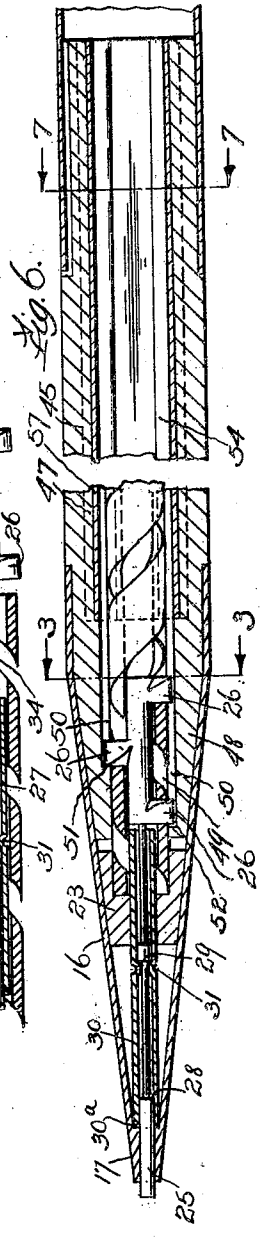


Fig. 6.

Witness.

Inventor.
Charles R. Keeran.
by [illegible]
his Attorneys.

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UNITED STATES PATENT OFFICE

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MECHANICAL PENCIL

Application filed July 2, 1929. Serial No. 375,430.

This invention relates to mechanical pencils, and has for a main object to provide a generally improved pencil construction that is capable of being economically manufactured. Another object resides in the provision of certain novel and simplified features in the operating mechanism for pencils of the type embodying propel, repel, expel action. A further object of the invention is to provide an improved construction adapted to obviate the slight reciprocating movement of the lead in the tip during use which sometimes occurs due to play resulting from the clearance between certain elements of the feed mechanism. It consists in certain features and elements of construction, herein shown and described, as indicated by the claims.

In the drawing:

Figure 1 is an enlarged fragmentary axial section through a mechanical pencil embodying the present invention.

Figure 2 is an enlarged fragmentary axial section through the lower portion of the pencil showing the lead propelling mechanism in position just after expulsion of the remnant portion of the lead through the tip.

Figure 3 is a transverse sectional view taken substantially as indicated at line 3—3 on Figure 2, and serving also to illustrate the contour of the parts at the plane of line 3—3 on Figure 6.

Figure 4 is a fragmentary longitudinal sectional view showing the lead propelling plunger disengaged from the coiled helix and showing, somewhat exaggerated, a portion of the plunger bent out of axial alignment for a purpose hereinafter explained.

Figure 5 is a fragmentary sectional view showing a modified form of telescopic connection between the lead carrier sleeve and the plunger.

Figure 6 is an axial section showing a modified construction in which a guide tube is frictionally secured in the bore of the barrel to provide a chamber for spare leads extending almost the entire length of the barrel.

Figure 7 is a transverse sectional view taken substantially as indicated at line 7—7 on Figure 6.

The pencil embodying the present invention includes the usual barrel 10 made of any suitable material such as wood, metal, bakelite or other molded composition, provided with an axial bore 11 having two longitudinally extending diametrically opposite guideways or grooves 12 formed therein, one terminating short of the tapered lower end at a stop shoulder 14, and the other groove stopping just inside the end at 15. Rotatably associated on the tapered portion 13 of the barrel is a tapered tip 16 having its lower end swaged to form an enlarged terminal bearing 17 for guiding the lead 18 therethrough. The terminal 17 is formed with an annular shoulder 19 on the inside of the tip to act as a stop as will hereinafter be described. Adapted to be telescoped into the bore of the barrel for rotation therein is an openly coiled helix 22 secured at its lower end in a bushing 23 which is permanently secured in the tip 16 by sweating, soldering or the like. Disposed in the bore of the barrel is a plunger 25 having a plurality of laterally extending driving lugs 26 adapted to engage between the coils of the helix and project laterally beyond said helix into the guideways 12 in said barrel permitting longitudinally non-rotative movement of the plunger when the helix is rotated.

The plunger proper is preferably of cylindrical formation and is provided with an intermediate reduced portion 27 forming oppositely facing stop shoulders 28 and 29 respectively. Slidably mounted on said plunger is a tubular lead carrying sleeve 30 formed intermediate its ends with a circumferential groove pressed in the material so as to result in an inwardly projecting annular bead 31 surrounding the reduced portion 27 of the plunger and serving to secure the lead carrying sleeve on said plunger while permitting a limited range of telescopic movement of these parts with respect to each other; the movement of the sleeve in the plunger being limited by the bead abutting against either of the shoulders 28 or 29 of said plunger. As shown in Figure 1, when the sleeve is in extended position with the bead abutting against the front shoulder 28, the end portion of the sleeve projects a sub-

stantial distance beyond the end of the plunger for receiving the rear end portion of the lead 18. It will be understood that this sleeve is made of relatively thin metal which may be formed either by rolling up a piece of sheet metal so that the longitudinal edges nearly abut each other, thus forming in effect a split tube; or the sleeve may be of tubular stock provided with a longitudinal slit, so that in either case the lead engaging end of the sleeve will act as a yielding clutch to frictionally secure the lead therein.

It will be apparent that as the lead is propelled through the tip by the rotation of the tip on the barrel, the plunger with its sleeve in place is axially moved in the helix and barrel, but is restrained against rotation by engagement of its lugs in the longitudinal guideways of the barrel. The exterior dimensions of the sleeve and the inside of the helix are such as to provide a relatively close fit to insure true guidance of the lead as it is being propelled or retracted. As the piece of lead is gradually used up, and the mechanism approaches the lower end of the tip, as shown in Figure 2, the end of the sleeve 30 will abut against the shoulder 19 in the tip and its movement will be arrested, while by continued rotation of the tip relative to the barrel, the plunger continues to feed the remnant of the lead through the terminal portion 17 of the tip. As shown in Figure 2, the plunger is so dimensioned relative to the sleeve that at the limit of lead expelling movement its lead engaging end projects slightly beyond the terminal end of the tip and the movement of the plunger in this direction with respect to the lead carrying sleeve may be limited by the shoulder 29 abutting against the bead 31 in said sleeve; but preferably the movement of the plunger with respect to the sleeve in this direction is limited by encounter of the lug 26 with the stop shoulder 14 formed at the end of one of the guideways in the barrel.

To insert a new lead, the tip is rotated in reverse direction so as to thread the helix out of engagement with the lugs of the plunger, thus permitting separation of the tip and barrel and affording access to the plunger and the lead carrying sleeve. The lead carrying sleeve is then grasped and pulled forwardly on the plunger into the extended position, as shown in Figure 1, with the bead 31 abutting against the shoulder 28, in position for receiving a new lead. The pencil may then be reassembled for use. The lead engaging end of the sleeve is preferably flared or conically counter-bored as indicated at 30^a so as to facilitate the insertion of a new lead in the clutch end.

This arrangement of the parts as above described is particularly advantageous in that it permits direct access to the plunger and lead carrying sleeve so as to facilitate replacement or repair of the parts if necessary. Having direct access to the lead carrier sleeve for insertion of a new lead also insures against damage to the sleeve or mutilation or breaking of the lead during insertion of a new lead, which is apt to result if these parts are completely housed in the barrel so that the lead must be inserted through the tip of the pencil.

As exaggerated in Figure 4, a portion of the plunger intermediate the stop shoulder 29 and the lugs 26 is slightly bent out of axial alignment, as shown at 34, so as to increase the frictional drag between the lugs and the helix when the plunger is in operative feeding engagement therewith; and the portion of the plunger intermediate the stop 29 and the innermost driving lug 26 is preferably reduced in cross sectional area so as to give a more resilient action. This increased frictional drag between the lugs of the plunger and the helix insures positive uniform movement in either propelling or repelling direction, and tends to prevent longitudinal play which would otherwise result from the clearance between the lugs and the coils of the helix. This feature is considered of importance in that it obviates the objectionable chattering caused by the slight reciprocating movement of a lead at the writing tip, which is usually due to the clearance between the cooperating parts.

Figure 5 illustrates a modified arrangement by means of which the lead carrying sleeve 38 is retained on the plunger 39 while permitting a limited range of telescopic movement. In this construction the cylindrical plunger is provided with a slot or guideway 40 extending in a spiral direction partially around it, and the sleeve is formed with an inward depression or node 41 extending into the slot 40. Thus when the sleeve is arrested in the tip by abutting against the shoulder 19, the continued movement of the plunger will be permitted, although it will cause the slot 40 and projection 41 to act cam-wise, forcing the sleeve 38 to rotate slightly around the plunger as the remnant of the lead is expelled through the tip. This particular construction is especially advantageous in that it permits positive ejectment of the remnant of the lead from the sleeve by merely rotating the sleeve on the plunger, as in cases when tip and helix are separated from the barrel 10, and a short remnant of the lead is found remaining in the lead carrier tube; the plunger, in such a case, projects loosely through the bore at the end of the barrel but offers no longitudinal resistance against which the lead carrier tube can be pushed back to release the remnant of lead; however, since the lugs of the plunger still engage the guideways 12, it is held against rotation while the sleeve 38 may

be twisted and thus forced back by the spiral groove, 40, so as to release the lead remnant.

In the construction illustrated in Figures 6 and 7, the barrel 45 is preferably formed of bakelite or other molded composition, and has included in its bore which extends a substantial portion of the length of the barrel, a pair of diametrically opposite longitudinally extending rounded or convex ribs 47. The tapered end portion 48 of the barrel is provided with a reduced bore 49 substantially the same as in Figures 2 and 3, and dimensioned for receiving the coiled helix, and this bore 49 is also provided with diametrically opposite longitudinally extending guide slots 50 for engagement by the lugs of the plunger. These slots terminate at shoulders 51 and 52 respectively, so as to prevent withdrawal of the plunger from the lower end of the pencil. Mounted in and extending substantially the length of the bore of the barrel is a guide tube 54 having its sides disposed in spaced relation to the inner wall of the barrel forming two spare lead chambers 55 on opposite sides thereof for storing relatively long leads (about four inches in length) such as indicated at 56.

This guide tube is formed with curved sides merging in opposed longitudinally extending ribs 57 which form on the inside of the tube guideways 58, adapted to be aligned with the guideways 49 in the tapered portion of the tip so as to provide a complete continuous guideway for the lugs of the plunger. The outer contour of the rib portion 57 is shaped to approximately conform to and telescopically engage the contour of the ribs 47 in the barrel, it being understood that this guide tube is made of sheet metal with the offset ribs 57 slightly flatter on their outer faces than the ribs 47 of the barrel so as to provide a forced fit in assembly, causing the rib portions 57 to be slightly flexed to insure a relatively tight frictional engagement with the ribs 47 for maintaining the tube in position against rotation and longitudinal separation. In this arrangement the helix will extend practically to the upper end of the barrel to provide sufficient movement of the plunger to accommodate the long leads. The upper end of this barrel may be provided with any suitable ferrule or cap and also with any additional means for closing the upper end of the guide tube if desired, so as to prevent removal of the plunger after it is once introduced therein. However, leaving the upper end of the tube accessible is of particular advantage in the event that the plunger needs to be replaced for some reason or other, so that it may be accomplished very easily and quickly and even by inexpert persons.

I claim:

1. In a mechanical pencil, a barrel having an axial bore with a longitudinal guideway, an externally accessible member rotatably associated with the barrel, an openly coiled helix connected with said member, and removably telescoped into the barrel for rotation therein, and a plunger in the bore adapted to be disposed in said helix, said plunger having a lead engaging end and the other end having a laterally projecting lug extending through the space between the coils engaging in the guideway, a portion of said plunger intermediate the lead engaging end and the lug being sprung out of axial alignment whereby to increase the frictional drag between the lug and the coiled helix.

2. In a mechanical pencil, a barrel having an axial bore with a longitudinal guideway, a tip rotatably associated with the barrel, an openly coiled helix carried by the tip and removably telescoped into the barrel for rotation therein, and a plunger in the bore adapted to be disposed in said helix, said plunger having a lead engaging end and the other end having a laterally projecting lug extending through the space between the coils engaging in the guideway, a portion of said plunger intermediate the lead engaging end and said lug being reduced in cross section and provided with a slight bend to increase the frictional resistance between the lug and the coiled helix.

3. In a mechanical pencil, a barrel having an axial bore and a longitudinal guideway opening off said bore, a tip rotatably associated with the barrel, an openly coiled helix carried by the tip and rotatable in said bore, a plunger adapted to be disposed in the helix and having a laterally extending lug projecting through the space between the coils in sliding engagement with the guideway by means of which the plunger is permitted axial non-rotative movement in the barrel, and a lead carrier sleeve telescopically associated with the plunger, said plunger having a reduced portion forming oppositely facing shoulders and said sleeve being formed with an inwardly projecting annular bead in registration with said reduced portion of the plunger and adapted to abut against said shoulders for limiting the telescopic movement of the parts in opposite directions, and said plunger having a portion intermediate said rear shoulder and the lug reduced in cross sectional area and sprung slightly out of axial alignment whereby to increase the frictional drag between said lug and coiled helix.

4. In a mechanical pencil, a barrel having a bore and a plurality of spaced longitudinally extending ribs therein and a guide tube having laterally offset portions adapted for engaging said ribs for securing said tube against rotation in the barrel.

5. In the combination defined in claim 4, said offset portions being dimensioned for a resiliently tight fit between said ribs for fric-

tionally securing said tube in position in the barrel.

6. In a mechanical pencil, a barrel having a bore and a pair of diametrically opposite longitudinally extending ribs on the inside of the barrel, and a guide tube disposed in the bore of the barrel having laterally opposite offset portions extending throughout a substantial portion of its length formed to frictionally engage said ribs for firmly securing the tube in place in the barrel.

7. In the combination defined in claim 6, the sides of said guide tube intermediate said longitudinal offset portions being in spaced relation to the inside of the bore to form spare lead chambers.

8. In a mechanical pencil, a barrel having a bore formed with a pair of diametrically opposite longitudinally extending inwardly projecting ribs, a guide tube disposed in the barrel and having a pair of opposite longitudinally extending offset portions formed to engage said ribs for frictionally securing said tube therein, said offset portions forming on the inner side of the tube, a pair of longitudinal guide slots, the lower end of the barrel having a reduced bore and a pair of diametrically opposite guide slots with which are registered the guide slots of the tube, a tip rotatably associated with the lower end of the barrel, an openly coiled helix carried by the tip and adapted to be telescoped into the barrel inside the guide tube for rotation therein, and a plunger carried in the bore of the barrel and having laterally projecting lugs extending through the spaces between the coils for engagement with the slots in the guide tube and lower end of the tip, whereby said plunger is restrained against rotation while being permitted longitudinal axial movement in the barrel.

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