July 1, 1930. C. R. KEERAN 1,768,694

MECHANICAL PENCIL

Filed Dec. 10, 1928

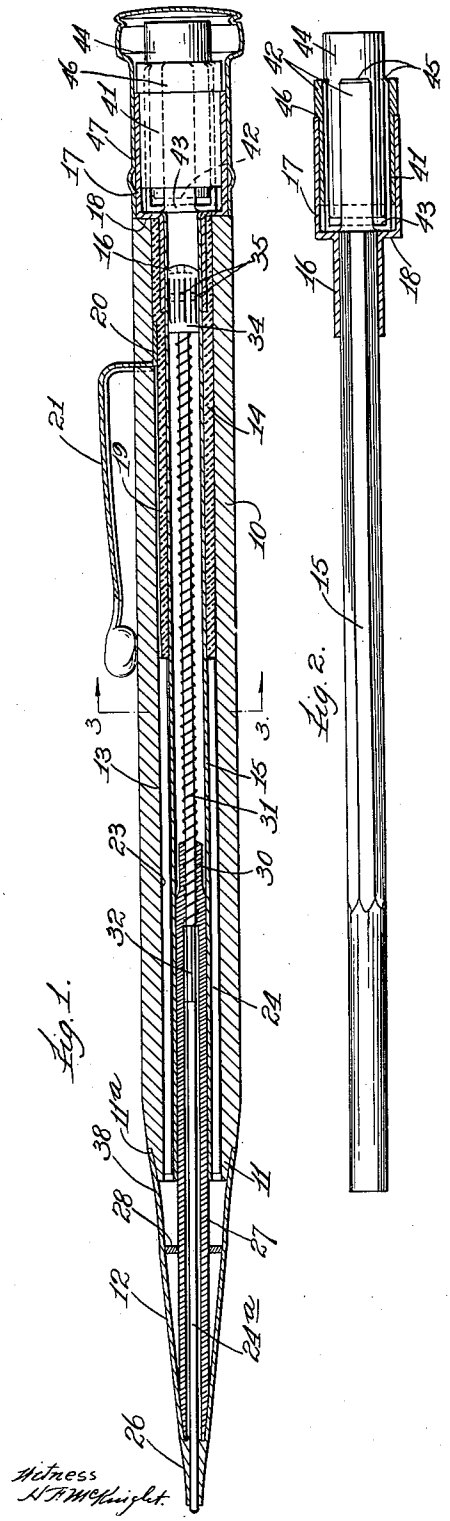


Fig. 1.

Fig. 2.

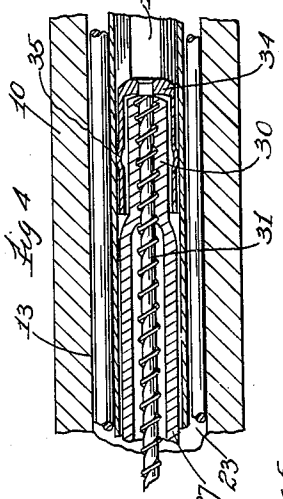


Fig 4

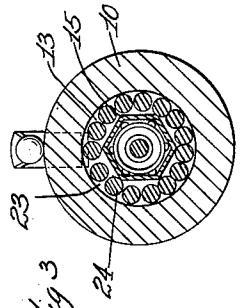


Fig 3

Fig. 5.

Fig. 6.

Witness
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UNITED STATES PATENT OFFICE

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MECHANICAL PENCIL

Application filed December 10, 1928. Serial No. 324,854.

The invention relates to mechanical pencils, and its purpose is to provide an improved pencil construction of relatively few parts of simplified and durable design which facilitate the assembly operation and which, as a whole, may be manufactured economically. It consists in certain features and elements of construction in combination, as herein shown and described, and as indicated by the claims.

In the drawings:—

Figure 1 is an enlarged axial section of a mechanical pencil constructed in accordance with the present invention.

Figure 2 is a side view of the guide tube of the barrel, with the eraser socket structure secured to its upper end, shown in section.

Figure 3 is a trans-axial section taken substantially as indicated at line 3—3 on Figure 1.

Figure 4 is an enlarged fragmentary axial section of certain parts of lead-propelling mechanism.

Figure 5 is a side elevation of the pencil shown provided with graduations as a scale for linear measurement.

Figure 6 is a fragmentary view of the upper end of the pencil, showing the cap in extended position for increasing the length of the scale to an exact number of units of measurement.

As illustrated in the drawings, the pencil includes a tubular body or barrel, 10, formed of any suitable material, such as wood, bakelite, various molded compositions, or metal, having one end provided with a reduced tapered portion, 11, on which is removably mounted a rotatable tapered tip, 12. The barrel is formed with a straight bore, 13, preferably annular, extending from end to end, and securely mounted in the upper end of the bore is a bushing, 14, extending a substantial length of the bore. Firmly mounted (as by drive or force fit) in the bushing is the upper end of a guide tube, 15, which is disposed concentrically in the bore, and is substantially co-extensive with the barrel. The upper end of the bushing is counterbored for the shank, 16, of the head sleeve, 17, which is preferably rigidly secured to the upper end of the guide tube, 15. The shank, 16, being inwardly offset from the sleeve proper, forms an annular shoulder, 18, adapted to be seated against the upper end of the barrel, as shown in Figure 1, for insuring proper positioning of the guide tube. To facilitate the assembly operation in general, it may be desirable to first assemble as a unit the guide tube, head sleeve and the bushing, and insert in position in the barrel. The bushing is provided with a longitudinal way, 19, in its outer periphery for engaging the tang, 20, of the clip, 21, for firmly securing the same in position.

The lower end of the guide tube being unsupported and in spaced relation to the wall of the bore, 13, forms an annular spare-lead chamber or magazine, 23, for leads, 24, the chamber opening at the end adjacent the tip; the inner end of the bushing serving to define the bottom of the chamber. This arrangement is particularly advantageous in that it affords access to the spare lead chamber simultaneously upon the removal of the tip from the barrel. Although the upper end of the guide tube, 15, is firmly supported in the bushing, the lower end being unsupported, and in a sense floating, is free to be flexed slightly out of its normal axial plane for a purpose hereinafter described. The inner end of the bushing preferably terminates at such a point that the spare lead chamber, 23, will have considerable depth for receiving relatively long leads of, say, two-inch length or greater, as compared to the usual inch and a half length leads provided for most pencils of this character.

The tapered tip, 12, is in the nature of a hollow shell of substantially conical formation, made of thin sheet metal. In forming the tip, the portion adjacent the apex is swaged in a manner to cause the metal to flow inwardly forming a terminal, 26, integral with the walls of the tip, and of a length several times the thickness of the wall, thus insuring proper support and guidance for the lead, 24^a, as it is fed therethrough. The terminal may be slitted to provide a yielding frictional grip on the lead as it is fed there-

through. Firmly secured concentrically in the tip is a lead tube, 27, of relatively thick stock, extending a substantial distance beyond the upper end of the tip and adapted to be telescoped into the unsupported end of the guide tube, 15.

A washer, 28, is sweated or soldered inside the tip which provides support for the lead tube and also serves as a stop for the leads in the magazine. The upper end of the lead tube is formed with a reduced neck portion, 30, internally threaded for engagement with the threaded portion, 31, of a plunger, 32, which is longitudinally movable in the lead tube and also in the guide tube when telescoped therein, as shown, in Figure 1. The plunger which normally is yieldingly held against rotation is provided with the same safety feature disclosed in my copending application, Serial No. 303,647, filed September 4, 1928, to prevent injury or breakage of parts due to jamming of the lead, or when the plunger has reached the limit of its longitudinal movement. As shown in the drawings this feature consists of a hollow resilient head, 34, of substantially tubular shape, rigidly fastened to the upper end of the plunger, 32, which co-operates with the inner surface of the guide tube, 15; this part of the tube being polygonal in cross-section,—herein shown as hexagonal. The polygonal formation of the guide tube extends through that portion of the length thereof which corresponds to the lead-feeding range of the plunger, 32, but the extreme lower end of the tube may be cylindrical to serve as a bearing for the lead tube, 27. The hollow head, 34, is longitudinally slitted to make it resilient, and the portions between the slits are provided with outwardly projecting nodes, 35, which are adapted to be positioned in V-grooves formed by the abutting walls of the guide tube, and thus provide proper guidance for the plunger as it is propelled longitudinally. The nodes yield to permit rotation of the plunger only when there is an obstruction to the longitudinal movement of the plunger, such as mentioned above.

The portion of the lead tube telescoped into the guide tube being of considerable length, affords a substantial bearing, and also provides ample friction to maintain adjustment. Due to the flexibility of the unsupported lower end of the guide tube, proper alignment of the parts in co-operative relation without undue binding when the tip is mounted on the barrel is assured even if the lead tube is slightly off center. Notwithstanding this flexibility, the tip is fitted firmly on the barrel and permits smooth and easy movement of the parts. It is apparent that if the lower end of the guide tube were rigidly supported it would be impossible to secure this accommodation of the guide tube to the lead tube. As will now be apparent the lead propeller mechanism operates in a usual manner by the relative rotation of the tip and barrel, moving the plunger longitudinally for forcing the lead through the tip. To insert a new lead in the lead tube, the tip and barrel are first separated, but preferably before actual separation the point may be tilted downwardly, causing the spare lead in the magazine to strike the washer, 28, so that when the tip and barrel are separated in horizontal position, the ends of the leads in the magazine will extend a short distance beyond the end of the barrel so as to facilitate the selection of a new lead.

The portion of the tip adjacent the base of the cone is concavely curved as indicated at 38, to provide a convenient finger engaging portion, thus tending to prevent slippage of the finger on the tip. The apex of the terminal, 26, is drawn straight for a short distance, and this formation taken with the concave portion, 38, in general causes the entire wall of the tip to appear concavely curved.

The base portion of the tip is shaped to snugly fit the tapered portion, 11, of the barrel in a wedging manner to provide sufficient friction against relative rotation of the tip and barrel. As the tapered portion, 11, wears down, the edge of the tip cuts into the shoulder, 11^a, to take up the wear and thus insures proper fit of these co-operating parts.

Seated in the fixed head sleeve, 17, is an annular eraser sleeve, 41, encompassing a plurality of yieldable eraser gripping prongs, 42, of a socket, 43, in which is firmly held an eraser, 44. The prongs, which normally tend to separate at their free end, are formed with inwardly projecting jaws, 45, for gripping into the eraser. By such an arrangement a long eraser may be used, and the eraser may be adjusted, from time to time in the jaws, as it is worn down, so that practically the entire eraser may be utilized. It will be understood that the prongs when free, are out of contact with the eraser, but upon sliding the sleeve over the prongs toward their free end, their jaws are forcibly projected into the eraser. The outer end of the sleeve, 41, is formed with an annular enlargement, 46, adapted to abut against the upper edge of the head sleeve, 17, preventing it from being moved totally within the head sleeve. The enlargement abutting the edge of the head sleeve, 17, insures that the sleeve, 41, has properly constricted the prongs to positively hold the eraser. The enlargement also serves as a convenient grip for removing it and the eraser socket from the head sleeve. It will be noted that the eraser sleeve, is of less length than the eraser socket, so that upon removal of both as a unit, the eraser socket may be easily ejected from the eraser sleeve to permit adjustment of the eraser in the jaws of the prongs. Snugly telescoped

on the head sleeve, enclosing the eraser, is a usual head or cap, 47, of suitable ornamental design.

As illustrated in Figure 5 the tip, barrel and head of the pencil are provided with two series of graduations forming continuous scales for linear measurement in both English and metric systems. The English scale starts at the end of the tip and the graduations are indicated in inch units on the tip, barrel and head; the graduation at the end of the first unit of measurement being adjacent the point at which the curved portion, 38, commences from the straight taper of the tip. For convenience the first unit is graduated in fractional inch units. As designed, the pencil is less than an exact number of units in length and inasmuch as the overall length of a pencil could be advantageously utilized as a unit measuring stick, I have provided the head sleeve with graduations corresponding to the graduations of the head when in position. By this arrangement the head may be extended outwardly on the sleeve to a predetermined position, as by aligning the inner edge of the head with a mark on the head sleeve (indicated at *a*,) so that the length from the end of the tip to the outer end of the head is an exact number of units, herein representing six inches. This feature has the advantage of being capable of application to the conventional pencil, without imposing any restrictions as to length.

The graduation for the metric system commences at the beginning of the concavely curved portion, 38, and at the end of the first inch unit of the English system, and extends to the outer end of the barrel. The tip is designed so that the distance from the beginning of the concavely curved portion to the edge of the tip is one centimeter, which is divided into millimeter graduations for convenience of measurement. The millimeter graduations of the first centimeter, which occupies the base or curved portion of the tip, are formed as circumferential score markings or grooves, as shown in the drawing. Making the graduations at this curved portion circumferential, breaks up the smooth surface which tends to further prevent slipping of the finger along the tip of the pencil.

By virtue of the floating or flexible mounting of the tube, 15, and also the free projection of the tube, 27, from its securement in the tip, I can obtain additional friction between these tubes when they are telescoped together by employing a slight initial deformation or bending of the tube, 27, as more fully disclosed and explained in my pending application Serial No. 197,793, filed June 10, 1927. Such curvature of the tube, 27, will merely exert a stress against the tube, 15, to maintain any position of adjustment of the tip and the lead therein.

I claim:—

1. A mechanical pencil including a barrel having one end reduced and shouldered, said reduced end including a tapered portion; and a removable tip of hollow conical formation adapted to be telescopically and rotatably mounted on said tapered portion with the edge of said tip abutting against the shoulder of the barrel, the inner wall of said tip being tapered at substantially the same angle as the tapered end of the barrel, to insure a relatively snug fit of the tip on the barrel, and adapted to take up the wear of the reduced end of the barrel, the edge of the tip serving to cut back the shoulder of the barrel as the reduced portion wears down.

2. A mechanical pencil comprising a barrel and a removable tip at one end, said tip being of substantially conical formation, the portion of the tip adjacent the base of the cone being provided with a plurality of circumferential corrugations, providing a convenient finger grip, said corrugations being axially spaced so as to serve as graduations of a scale for linear measurement.

3. A mechanical pencil comprising a barrel, a removable tip telescopically associated therewith at one end, said barrel having a longitudinal bore, a guide tube concentrically disposed in the bore and firmly secured at its upper end in the bore of the barrel, the opposite end of the tube adjacent the tip being unsupported and adapted to permit slight flexing thereof out of axial alignment, and a plunger operatively associated with the tube and tip for feeding a lead therethrough.

4. A mechanical pencil comprising a barrel provided with a longitudinal bore, a removable tip rotatably engaged with one end of the barrel, a guide tube disposed concentrically in said bore and firmly secured therein at its upper end, the lower end of said tube being in spaced relation in the bore to form an annular spare-lead magazine opening at the end adjacent the tip, and a plunger operatively associated with the guide tube and the tip for propelling a lead therethrough.

5. A mechanical pencil comprising a barrel having a longitudinal bore, a removable tip engaged with one end of the barrel, a guide tube disposed centrally in the bore and firmly secured therein at the upper end, the lower end of the tube being unsupported in the bore and adapted to be yieldingly flexed out of axial alignment, a lead tube secured to the tip and adapted to be telescoped into the lower end of said guide tube, and a plunger having threaded engagement with the lead tube and longitudinally movable but held against rotation in said guide tube for feeding a lead through the tip.

6. A mechanical pencil comprising a barrel provided with a bore extending longitudinally from end to end, a removable tip telescoped on the lower end of the barrel, a bush-

ing secured in the upper end of the bore, a guide tube of substantially the same length as the barrel and firmly secured at its upper end in said bushing, the lower end being in spaced relation in the bore forming an annular spare-lead chamber, the inner end of the bushing serving as the bottom of the chamber, a lead tube secured to said tip, having an extended portion adapted to be telescoped into the lower end of the guide tube, and a plunger having threaded engagement with the lead tube and being longitudinally movable in the guide tube for feeding a lead through the tip.

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