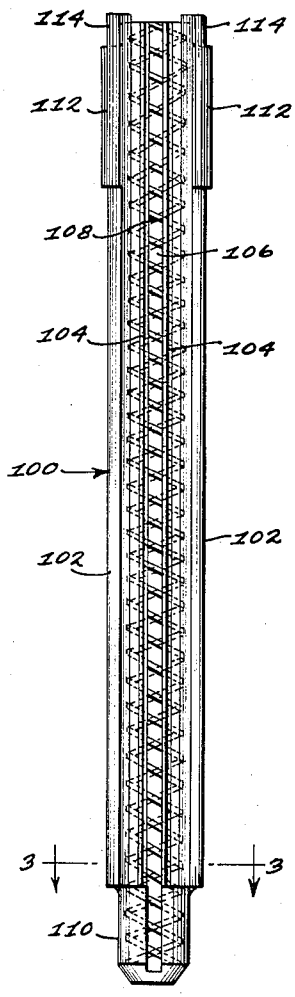
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PLASTIC MECHANICAL PENCIL FEED TUBE

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Fig. 1



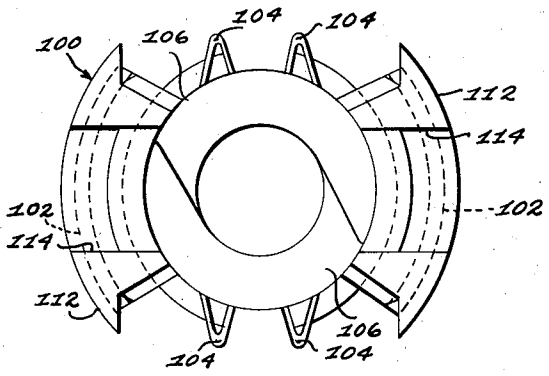


Fig. 2

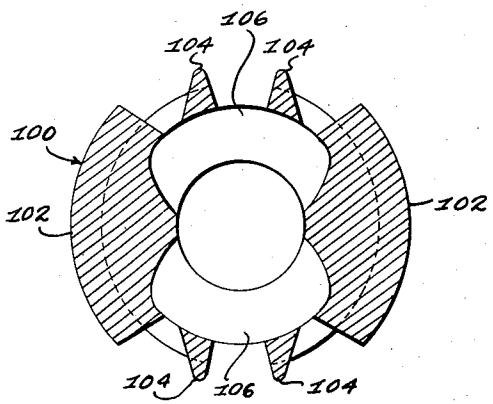


Fig. 3

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Fig. 4

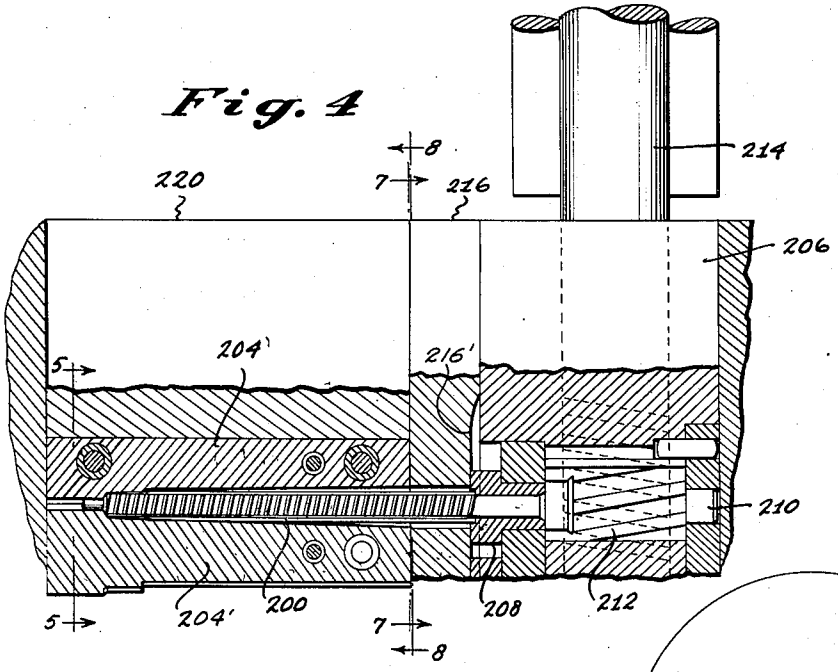


Fig. 5

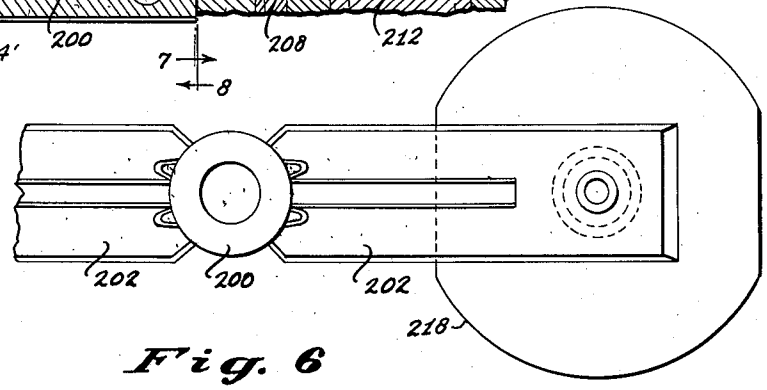
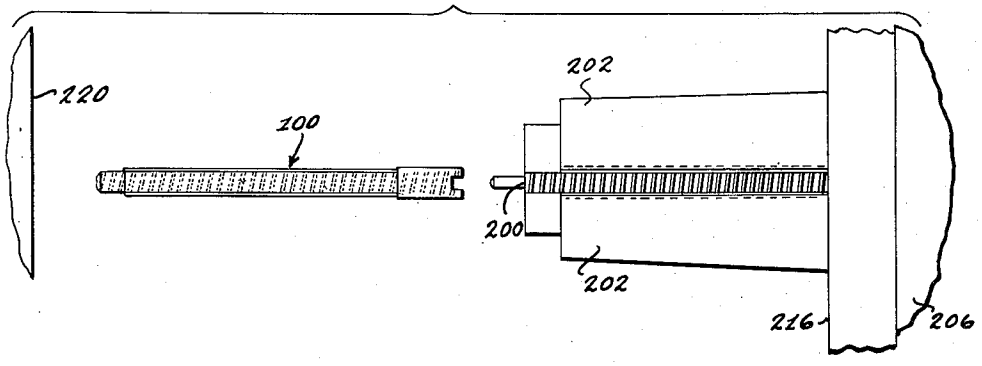


Fig. 6



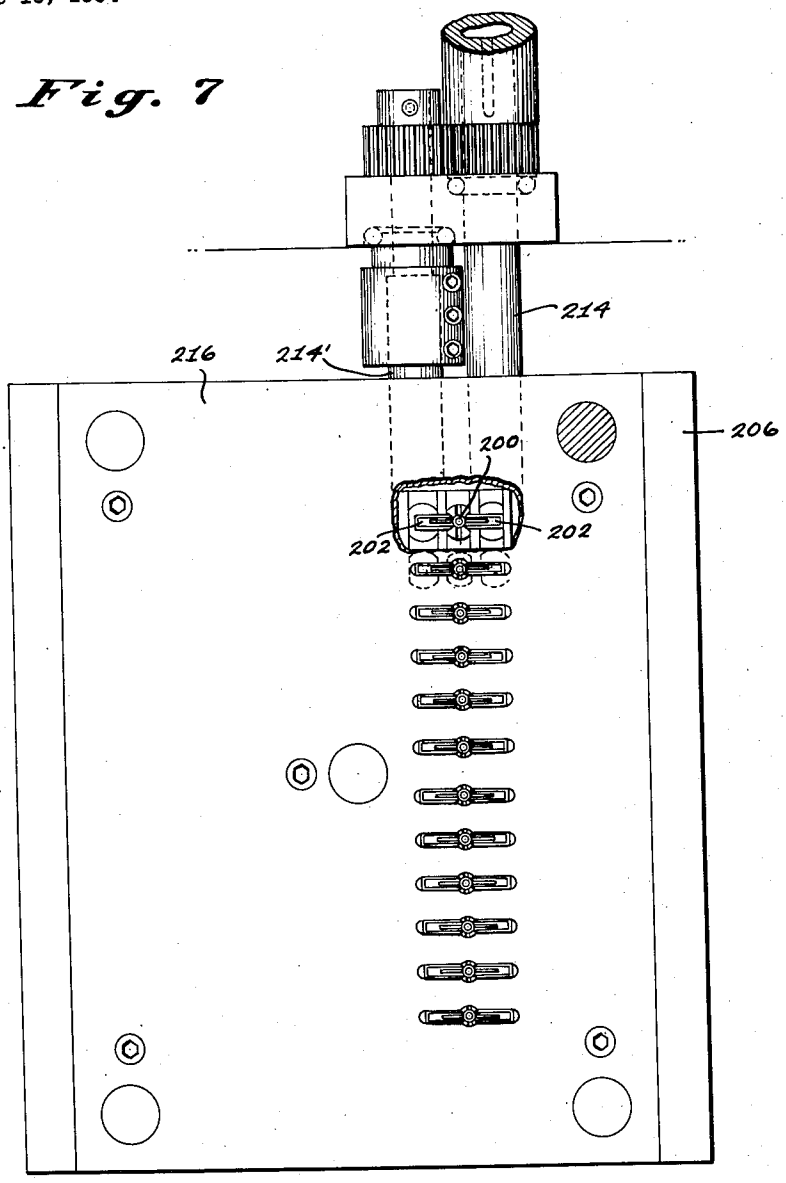
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Fig. 7



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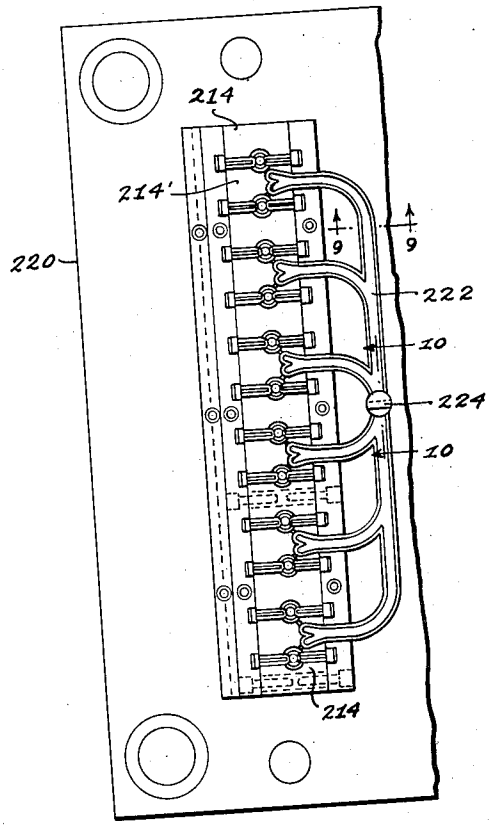


Fig. 8

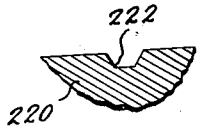


Fig. 9

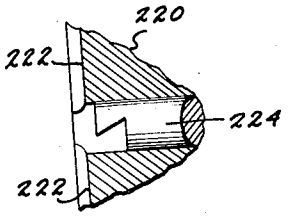


Fig. 10

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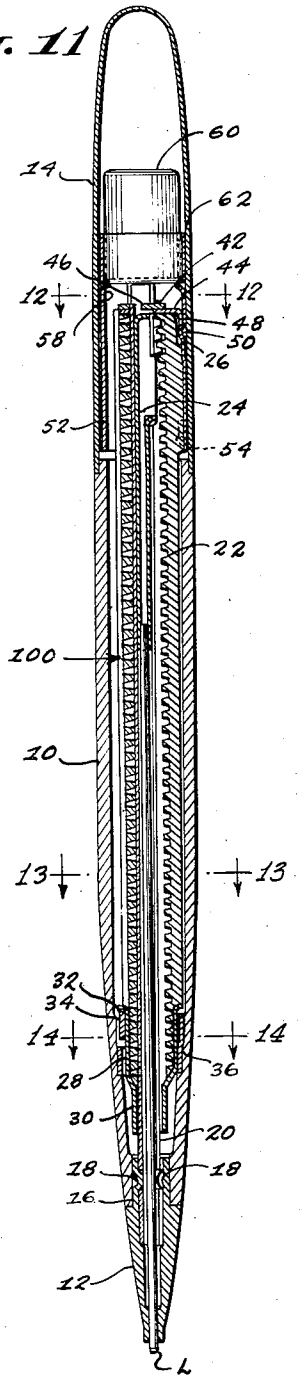
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Fig. 11



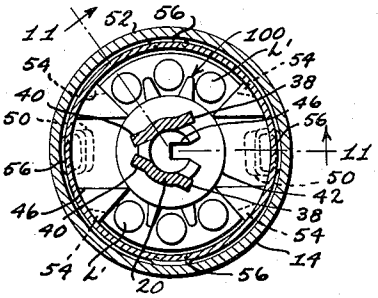


Fig. 12

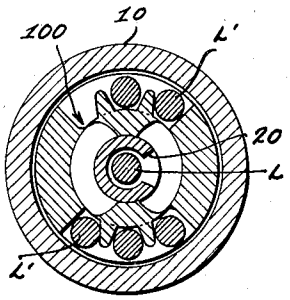


Fig. 13

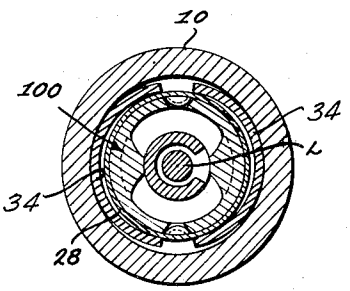


Fig. 14

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United States Patent Office 2,831,459 Patented Apr. 22, 1958

2,831,459

PLASTIC MECHANICAL PENCIL FEED TUBE

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Application June 15, 1954, Serial No. 436,927

4 Claims. (Cl. 120—14.9)

This invention relates to feed tubes for use in mechanical pencils of the type in which a screw actuated lead feeding mechanism is employed, and more particularly to an improved feed tube of this sort and to the method and means by which it is formed of a unitary body of plastic material arranged so as to serve not only as a feed tube, but also for partitioning a pencil barrel to provide a magazine therein for storing spare leads.

This improved feed tube and the method and means for forming it according to the present invention are described in detail below in connection with the accompanying drawings, in which:

Fig. 1 is a side elevation of a mechanical pencil feed tube embodying the present invention;

Fig. 2 is an enlarged top end view of the feed tube shown in Fig. 1;

Fig. 3 is a transverse sectional detail taken substantially on the line 3—3 in Fig. 1;

Fig. 4 is a fragmentary detail, partly cut away and sectioned, illustrating the means by which the feed tube shown in Fig. 1 is formed according to the present invention;

Fig. 5 is a transverse sectional detail of the mandrel and mandrel guides taken substantially on the line 5—5 in Fig. 4;

Fig. 6 is a fragmentary plan view illustrating, more or less diagrammatically, the manner in which a feed tube formed by the means illustrated in Fig. 4 is removed therefrom;

Fig. 7 is an elevation taken substantially at the line 7—7 in Fig. 4 and illustrating further the arrangement of the stationary portion of the means illustrated in Fig. 4;

Fig. 8 is an elevation taken at the line 8—8 in Fig. 4 and illustrating further the arrangement of the movable portion of the means illustrated in Fig. 4;

Fig. 9 is a fragmentary sectional detail taken substantially at the line 9—9 in Fig. 8;

Fig. 10 is a fragmentary sectional detail taken substantially at the line 10—10 in Fig. 8;

Fig. 11 is a longitudinal section, taken substantially at the line 11—11 in Figure 12, of a representative mechanical pencil structure incorporating a feed tube arranged according to the present invention;

Fig. 12 is a transverse sectional detail taken substantially at the line 12—12 in Figure 11;

Figure 13 is a transverse sectional detail taken substantially at the line 13—13 in Figure 11; and

Fig. 14 is a transverse sectional detail taken substantially at the line 14—14 in Figure 11.

The embodiment of the feed tube of the present invention illustrated in the drawings is indicated generally by the reference numeral 100. As shown, this feed tube 100 is characterized in form by opposed longitudinal land portions 102 and intermediately spaced longitudinal ribs 104. The feed tube 100 is of generally tubular form, the inner surfaces of the land portions 102 and ribs 104 are aligned about a circumference of feed tube bore size (i. e., a size proportioned for the lead feeding mechanism in

which the feed tube 100 is to be used), and these inner surfaces have spaced portions of continuous internal feed threads 106 (shown as double threads) formed therein by an internal groove and extending successively between the land portions 102 and ribs 104 with the extending portions of the feed threads 106 separated at the major diameter thereof, as seen best at 108 in Fig. 1. The longitudinal land portions 102 and ribs 104 accordingly form longitudinal grooves in the exterior surface of the feed tube 100 which extend into the body of feed tube 100 in depth to meet the internal groove or grooves forming the feed threads 106, so that the outside wall diameter of the feed tube 100 at the bottom of the longitudinal grooves thus formed is equal to the major diameter of the feed threads 106, and the resulting longitudinally grooved wall portions in the feed tube 100 can be readily arranged for storing spare leads inside a pencil barrel (as at L' in Figs. 12 and 13) by forming the land portions 102 with an outside diameter exceeding the major diameter of the feed threads 106 by at least the diameter of pencil lead that may be accommodated within the bore of the feed tube 100, and by spacing the longitudinal ribs 104 to receive spare leads at each side thereof.

The land portions 102 and ribs 104 terminate in spaced relation from the forward end of the feed tube 100 to provide a forward shank portion 110, and rearwardly the land portions 102 are enlarged in diameter at 112 and have recesses 114 formed therein, for the purpose of assembly as an element of a lead feeding mechanism within a pencil barrel as described further below.

As previously mentioned, the feed tube 100 is formed according to the present invention of a unitary body of plastic material, and in this connection it should be noted that the land portions 102 are longitudinally tapered in outside diameter in one direction (i. e., from top to bottom as seen in Figs. 1 and 2) and in width in the opposite direction, while the ribs 104 are longitudinally tapered both in width and height in this specified opposite direction (i. e., from bottom to top as seen in Figs. 1 and 2) By this arrangement, the feed tube 100 is adapted for formation as a unitary plastic body in accordance with the method and means of the present invention described below.

Fig. 4 of the drawings illustrates the basic arrangement of the means employed according to the present invention for forming the feed tube 100. As illustrated, this means comprises a threaded mandrel 200, mandrel guide members 202 having longitudinally grooved faces disposed in supporting contact with the mandrel 200 at opposed longitudinal portions thereof (compare Figs. 5 and 6), and complementary mold members, as at 204 and 204', arranged for closing longitudinally on the mandrel 200 and guide members 202 to define a complete mold cavity therewith. The mandrel 200 is carried by a fixed support 206 in which it is journalled for rotation about its longitudinal axis at a bushing 208 and a rear journal portion 210 at either side of a worm pinion 212 arranged on each mandrel 200 for engagement by worm shafts 214 and 214' extending through the fixed support 206 for rotating the mandrel 200 when desired, as explained further below. The fixed support is fitted with a front cover plate 216 by which the mandrel 200 is assembled in place, the cover plate 216 being grooved as at 216' for fixing the mandrel bushing 208 in place against rotation to serve further as a means for forming the previously mentioned recesses 114 in the land portion enlargements 112 of the feed tube 100.

The mandrel guide members 202 are also fixed in place by the cover plate 216, each guide member 202 being fitted with a mounting base 218 at which it is positioned on the fixed support 206 (compare Figs. 5 and 7). The complementary mold members 204 and 204' are carried by a

movable chase 220 arranged for moving longitudinally of the mandrel 200 and guide members 202 to close the mold members 204 and 204' thereon and thereby form a mold cavity as illustrated in Fig. 4, and to withdraw the mold members 204 and 204' in order to open the mold cavity as indicated in Fig. 6. Fig. 7 shows the fixed support 206 with a plurality of mandrels 200 and associated guide members 202 arranged thereon for operation in relation to the chase 220 arranged as shown in Fig. 8 with mold members 204 and 204' mounted thereon in a sufficient number to form a corresponding plurality of complementary mold cavities to receive the mandrels 200 and guide members 202. As mounted on the chase 220, the mold members 204 form the end members of a stack between which the mold members 204' are arranged with double faces to serve in relation to each of two adjacent mandrels 200. The chase 220 is formed in the usual manner with runner channels as at 222 for injecting plastic material within the mold cavities thereof, and is equipped with a sprue puller 224 as illustrated further in Fig. 10 for stripping plastic material from the runner channels 222 when the mold set is opened.

In operation, with the movable chase 220 closed against the front cover plate of the fixed mold set support 206, as seen in Fig. 4, to dispose the mold members 204 and 204' in position for forming mold cavities with the mandrels 200 and guide members 202, plastic material may be injected in the usual manner within the mold cavities thereby formed to mold the injected plastic in the form of the feed tube 100 illustrated in Figs. 1, 2 and 3. Following injection of the plastic material and after setting of this material within the mold cavities, the movable chase 220 is withdrawn, in the course of which withdrawal the previously mentioned taper at the outside diameter of the land portions 102 allows the molded material to strip readily from the mold members 204 and 204', which form this taper, and the sprue puller 224 operates to break off therefrom the plastic material remaining in the runner channels 222, leaving the molded bodies of the feed tubes 100 on the threaded mandrels 200 and between the guide members 202. At this time, rotation of the mandrels 200 is also started, from the drive provided through the worm shafts 214 and 214', in a direction that serves to unscrew the molded feed tubes 100 from the mandrels 200, so that the feed tubes 100 are freed to drop out of the mold set when the movable chase 220 is fully withdrawn to open position as illustrated in Fig. 6. During rotation of the mandrels 200 the plastic bodies forming the feed tubes 100 are held against rotation by the guide members 202 and guided thereby off of the mandrels 200, the previously noted opposite width taper of the land portions 102 and similar width and height taper of the longitudinal ribs 104 providing for guided release of the feed tubes 100 by the complementary form of the guide members 202 as the feed tubes unscrew from the rotating mandrels 200.

By virtue of the above described molding method and means it is possible to form the feed tubes 100 readily with the relatively small diameter bore required therein, because the mandrels 200 are always directly supported by the guide members 202 so as to eliminate the difficulty that would otherwise be encountered with bending or deflection, and consequent breaking, of mandrels 200 small enough to form the size of feed tube bore required. Without this arrangement for supporting the mandrels 200 it would be impractical to form the feed tubes 100 as a unitary plastic body as is done according to the present invention.

Figs. 11 to 14 of the drawings illustrate a representative mechanical pencil structure incorporating a feed tube 100 formed in accordance with the present invention, the mechanical pencil shown comprising a barrel 10 fitted with a writing tip 12 at its forward end and having a removable cover cap 14 arranged at its rear end. The writing tip 12 is fitted to the barrel 10 at a shank portion 16 the walls of which are dimpled as at 18 to fix a longitudinally slotted guide tube 20 therein for directing a writing lead L through the tip 12 from the barrel 10. Inside the guide tube 20 a lead clutch sleeve 22 and propelling member 24 are arranged as an assembled unit for gripping the rear end of the lead L and feeding it through the writing tip 12, the propelling member 24 having thread lugs 26 formed thereon to project laterally through the longitudinal slot of the guide tube 20 for actuation from the feed tube 100 of the present invention.

The feed tube 100 carries an alignment sleeve 28 at its forward end that extends to a necked down portion as at 30 to ride the outer surface of the guide tube 20, and that has an outwardly formed rear flange 32 resting on drag wing portions as at 34 of a friction band 36 seated in the pencil barrel 10 for rotatably supporting the feed tube 100 and imposing a sufficient friction drag thereon to prevent reverse motion of the lead feeding mechanism under writing pressure. The feed tube 100 is retained in assembled relation with the barrel 10 by the guide tube 20 which extends rearwardly from the feed tube 100 where it has assembly ears 38 and 40 struck out to overlie a top washer 42 and thrust washer 44 arranged at the rear face of the feed tube 100. The top washer 42 is formed with a key lug 46 arranged to extend within the longitudinal slot of the guide tube 20 so as to remain stationary therewith, while the thrust washer 44 has arm portions 48 fitted to the rear end of the feed tube 100 and assembled thereon by dimples as at 50 in a lock sleeve 52 which in turn is anchored on the rear end portion of the feed tube 100 by a number of inwardly crimped ears 54. The lock sleeve 52 is also formed with a series of circumferentially spaced longitudinal ribs 56 to provide for retaining the removable cover cap 14 on the barrel 10 with a sliding fit, and the lock sleeve 52 further has inwardly struck ears 58 spaced from its rear end to serve as bottoming lugs on which an eraser 60 jacketed with a suitable ferrule 62 may be seated within the rear end of the lock sleeve 52; the eraser 60 further serving as a rear end closure for the storage space provided inside the pencil barrel 10 by the feed tube 100 to contain spare leads L' as previously mentioned.

The present invention has been described above for purposes of illustration only and is not intended to be limited by this description or otherwise except as defined in the appended claims.

I claim:

1. A mechanical pencil feed tube comprising a unitary plastic body of generally tubular form having an internal bore of relatively small diameter and an internal thread forming groove, and opposed external longitudinal land portions and spaced longitudinal ribs intermediate said land portions forming external longitudinal grooves therebetween, said longitudinal grooves extending into said body in depth to meet said internal thread forming groove.

2. A mechanical pencil feed tube comprising a unitary plastic body of generally tubular form having an internal bore of relatively small diameter and an internal thread forming groove, and opposed external longitudinal land portions and spaced longitudinal ribs intermediate said land portions forming external longitudinal grooves therebetween, said longitudinal grooves extending into said body in depth to meet said internal thread forming groove, and said ribs being spaced between said land portions by at least the diameter of pencil lead that may be accommodated by said feed tube bore.

3. A mechanical pencil feed tube comprising a unitary plastic body of generally tubular form having an internal bore of relatively small diameter and an internal thread forming groove, and opposed external longitudinal land portions and spaced longitudinal ribs intermediate said land portions forming external longitudinal grooves therebetween, said longitudinal grooves extending into said body in depth to meet said internal thread forming groove, said ribs being spaced between said land portions by at least the diameter of pencil lead that may

be accommodated by said feed tube bore, and said land portions being longitudinally tapered in outside diameter in one direction and in width in the opposite direction and said ribs being longitudinally tapered both in width and in height in said specified opposite direction.

4. In a mechanical pencil incorporating a barrel and a screw actuated lead propelling mechanism housed within said barrel, a feed tube for said lead propelling mechanism comprising a unitary body of plastic material having an outside diameter approaching closely the inner diameter of said barrel, said plastic body being formed with an internal bore of relatively small diameter and an internal thread forming groove, and having opposed external longitudinal land portions and spaced longitudinal ribs intermediate said land portions forming external longitudinal grooves therebetween, said longitudinal grooves extending into said body in depth to meet said internal thread forming groove and said ribs being spaced between said land portions by at least the diameter of pencil lead that may be accommodated by said feed tube bore.

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