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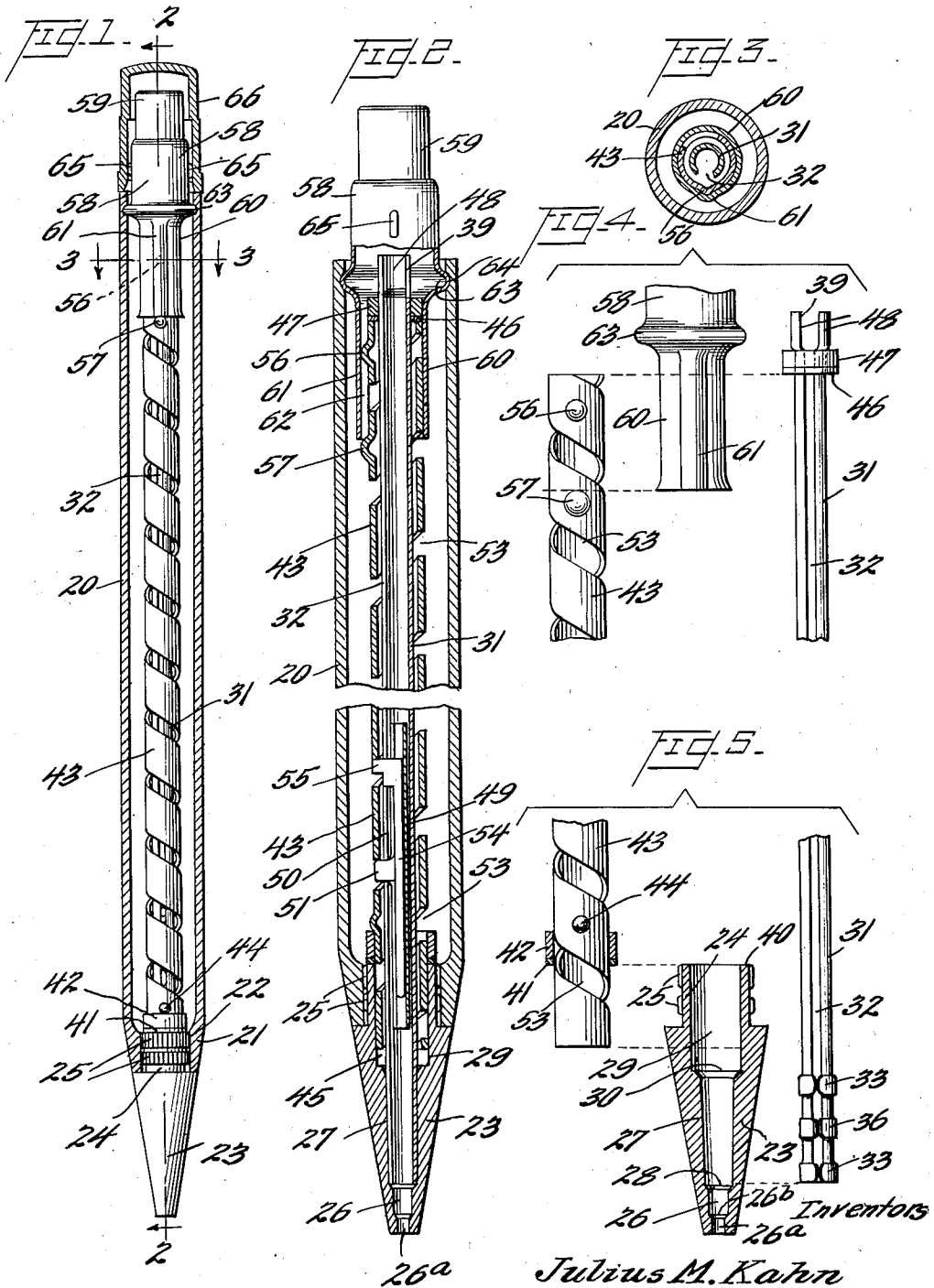
J. W. PARA ET AL

2,293,621

MECHANICAL PENCIL

Filed April 16, 1940

2 Sheets-Sheet 1



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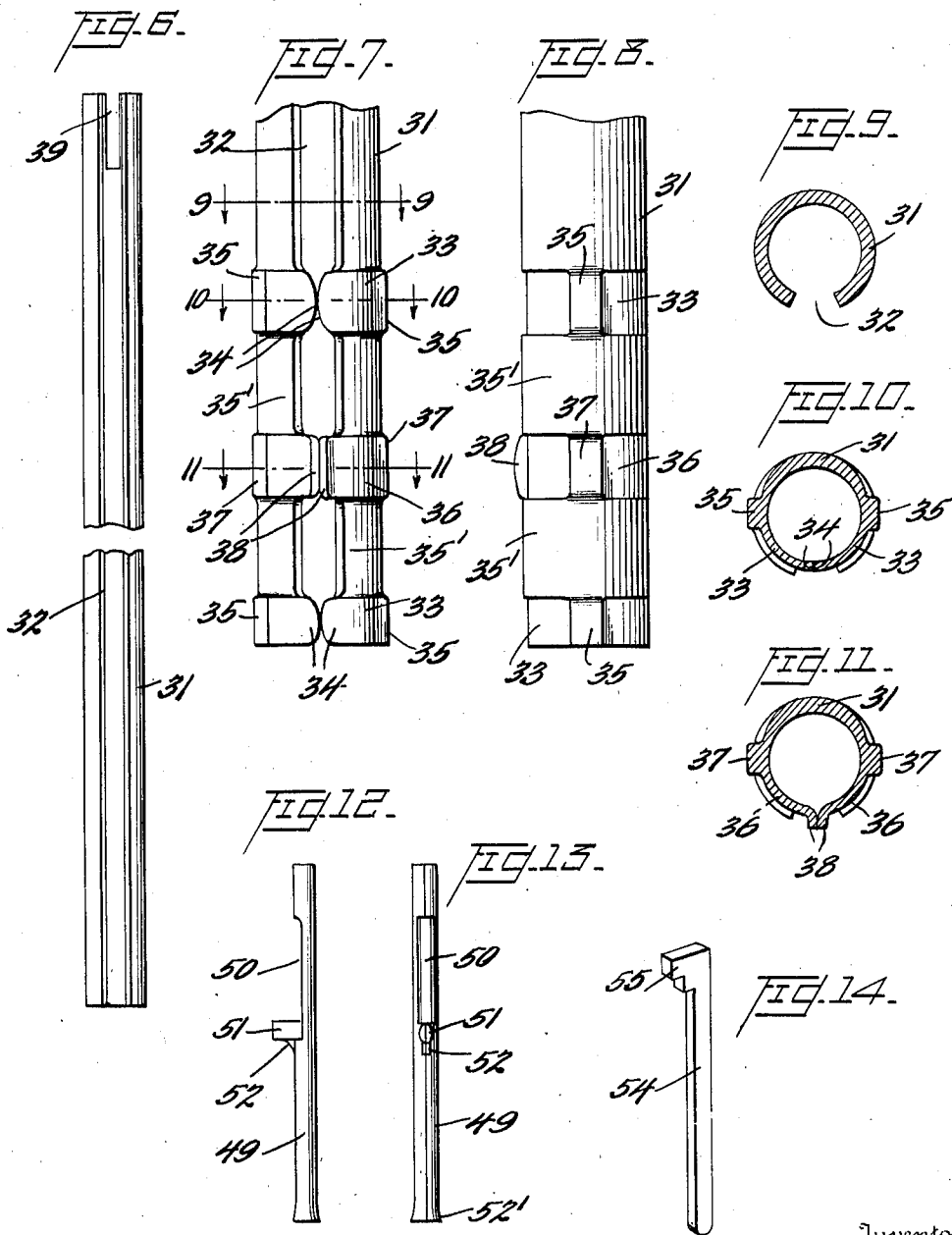
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# UNITED STATES PATENT OFFICE

2,293,621

## MECHANICAL PENCIL

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21 Claims. (Cl. 120—18)

The invention relates to the manner in which the actuating tube or spiral is supported for revolution at the tip and to the manner in which the driver tube is connected to the actuating tube to rotate the latter.

One important object of the invention is to so improve the construction of the connection between the runner tube and the tip that the slot in the runner tube is prevented from improperly closing and thus interfering with the action of the lead carrier.

A second object of the invention is to provide a runner tube for a mechanical pencil with a plurality of transversely and longitudinally extending ribbed portions so as to facilitate the firm connection of the runner tube with the pencil tip.

A third object of the invention is to provide a runner tube with a plurality of integrally formed transverse and longitudinally extending ribs, at least some of these ribs being so positioned as to prevent the improper spacing of the runner tube slot during the frictional connection of the runner tube with the pencil tip.

A fourth important object of the invention is to provide a novel construction of the lead carrier wherein the lug of the carrier which fits in the slot of the spiral actuating tube is supported against distortion and is also caused to fit snugly in such slot.

A fifth important object of the invention is to provide novel means for revolvably supporting the end of the actuating tube in spaced relation to the bottom of the opening or seat in the tip receiving the same so that the lug of the lead carrier may be received in such space upon the lead carrier being moved to its lowermost position.

A sixth important object of the invention is to provide novel means whereby the driver tube is connected to the actuating tube.

A seventh important object of the invention is to provide a novel construction of pencils of this character wherein improved means are used for effecting longitudinal compression of the actuating tube or spiral upon the parts being assembled.

With the above and other objects in view the invention consists in general of certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims.

In the accompanying drawings, like characters of reference indicate like parts in the several views, and

Figure 1 is a side view of a pencil constructed in accordance with this invention, the barrel and cap being shown in section to disclose the working parts within such barrel and cap.

Figure 2 is an enlarged fragmentary section on the line 2—2 of Figure 1.

Figure 3 is an enlarged section on the line 3—3 of Figure 1.

Figure 4 is a group view of certain parts at the upper end of the pencil separated from each other but showing the longitudinally disposed relationship of such parts.

Figure 5 is a view similar to Figure 4 and showing parts at the lower end of the pencil.

Figure 6 is a fragmentary elevation of the runner tube rolled to shape but without having the circumferential and longitudinal ribs formed thereon.

Figure 7 is a greatly enlarged view of the lower part of the runner tube, the view being taken facing the slot of the runner tube.

Figure 8 is a view of the lower part of such runner tube on the same scale as Figure 7 but at right angles thereto.

Figure 9 is a section on line 9—9 of Figure 7.

Figure 10 is a section on the line 10—10 of Figure 7.

Figure 11 is a section on line 11—11 of Figure 7. Figure 12 is a side elevation of the lead carrier.

Figure 13 is a side elevation of the lead carrier at right angles to Figure 12.

Figure 14 is a perspective view of the lead expeller on a greatly enlarged scale.

In the embodiment of the invention as disclosed herein, the pencil includes a barrel 20 having a generally cylindrical shape over the greatest part of its length and a short frusto-conical portion 21 at its lower end which is provided with walls of a somewhat greater thickness than the walls of the main portion of the barrel. Inserted into the lower end of the barrel is a tip 23 of conical shape corresponding to the frusto-conical portion 21. The tip 23 is also provided with a boss 24 projecting from the upper end and carrying a pair of circumferential ribs 25 provided with serrations extending longitudinally of the pencil. The boss 24 is inserted in the lower part of the barrel and the serrated ribs engage the wall of the opening 22 so as to hold the tip firmly in the barrel and against rotation with respect thereto. The tip is provided with a stepped axial bore, including a portion 26a of sufficiently great diameter to accommodate the lead used in the pencil, and a portion 26 capable of accommodating the lead carrier. Above the

portion 26 there is also provided a tapered portion 27 which is adapted to receive and firmly hold the runner tube of the pencil to be hereinafter described.

The uppermost part 29 of the bore in the tip is of sufficient size to rotatably receive the actuating spiral of the pencil mechanism which will be hereinafter described in detail.

The shoulders between any two parts of the bore provides a short downwardly tapering wall portion. These are designated by the reference numeral 26b, 28 and 30, respectively. The purpose of these tapering portions is to permit and facilitate the entry into each respective part of the bore of the portion of the pencil mechanism which is adapted to be seated and/or rotate therein.

Thus, the tapering shoulder 30 will facilitate the entry of the runner tube into the bore 27. The tapering shoulder 28 will facilitate the entry of the lead carrier into the bore 26, and the shoulder 26b will facilitate the passage of the lead through the bore 26a as it is propelled from the pencil.

The runner tube, during the first portion of its manufacture, is made in the usual manner. That is to say, a flat strip of thin metal is rolled to provide a tube 31 having a slot 32 extending from end to end thereof, this slot being for the accommodation of the lugs on the lead holder and lead expeller as will be presently described. In the present construction the lower end of the runner tube is subjected to the action of a die or dies to produce inwardly struck circumferential arcuate portions 33 and the inwardly struck material at each side of the slot is spread as at 34 to contract the slot at such inwardly struck portions as may be seen best by reference to Figures 7 and 10. This die forming operation also produces outwardly projecting longitudinal ribs 35. As here shown there are two portions thus subjected to the die forming operation just described, one of these being at the lower extremity of the tube and the other spaced thereabove. Furthermore the tube is provided between these two portions with a third similar portion having depressed arcuate portions 36, ribs 37, and inwardly projecting portions 38. It is to be noted that in addition to the longitudinally extending ribs 35 formed in accordance with the hereinbefore described operation there is also formed a series of circumferentially or transversely extending ribs or projections between the inwardly struck arcuate portions 33 and the portions 36. These relatively wide projecting or rib-like portions are indicated by the reference numerals 35'. The function of these circumferential or transversely extending ribs is to prevent the withdrawal of the runner tube from the tip, this function being in general similar to that performed by the transversely extending rib portions described in United States Patent No. 2,093,919.

The inwardly projecting portions 38 are distinguished from the portions 34 in that the portions 38 are turned outwardly so as to form abutting lips. These lips are normally in contact with one another and prevent the tube from being compressed to such an extent that the slot 32 will be partially closed. Although the portions 34 are normally intended to prevent closure of the slot it has been found that in some instances when the runner tube is forced into the tapering tip that the portions 34 tend to overlap. This results in a slot 32 which is too narrow to receive the lug of the lead carrier and/or the lead ex-

pellor. Such a condition is prevented by the abutting upturned portions 38. Instead of a single upturned portion, it is obvious that a plurality of portions may be provided, i. e., the portions 34 may be turned outwardly to lie in abutting relation in a similar manner to the portions 38. The upper end of the runner tube 31 is also provided with a slot 39. This slot is formed in the upper end of the runner tube diametrically opposite to the runner tube slot 32 for a purpose to be hereinafter described. It is to be noted that the runner tube 31 extends upwardly through the bore 29 and by reason of the difference in the diameter of the tube 31 and bore 29 an annular chamber is formed in the pencil around the tube 31.

Referring once again to the boss 24 it is desired particularly to point out that the upper end thereof is flattened to provide an annular seat 40. Positioned on the seat 40 is an anti-friction washer 41 upon which rests a sleeve or bushing 42. An actuating tube or spiral 43 is also provided of such diameter that it fits snugly yet rotatably in the bore 29. The spiral is provided adjacent its lower end with a small outwardly struck boss 44 which normally rests on top of the sleeve 42 and thus limits the downward movement of the actuating tube or spiral. The proportioning of the parts just hereinbefore described and the location of the boss 44 is such as to support the lower end of the actuating tube 43 so that an annular chamber 45 is provided in the bore 29 below the lower end of the actuating tube 43. At the upper end of the actuating tube there is provided an anti-friction washer 46 which closely surrounds the runner tube 31. A collar or bushing 47 is fitted on the tube 31 above the washer 46 and the spiral, runner tube, anti-friction washers and bushings hereinbefore described are all held in assembled relation by ears or lips 48 struck out from the material at the upper end of the runner tube defined by the slot 32 and the slot 39. The length of the actuating tube 43 and the position of the sleeve 47 are so regulated that when the actuating tube has been slipped over the runner tube and the lower end of the latter forced into the bore 27 to seat on the shoulder 28 the spiral actuating tube will be subjected to longitudinal compression. The purpose of thus assembling the spiral is to place sufficient tension thereon to prevent the spiral from turning of itself and thereby supplies a positive breaking action to the lead carrier and the lead carried thereby. Accidental retraction of lead is thus prevented during writing. Preferably, though not necessarily, the spiral is compressed to such an extent that the coils of the spiral tend to come closer together and thus cause the spiral to exert a constant outward pressure against the two-end anti-friction or lubricating washers 46 and 41. The action of these washers in promoting the smooth operation of pencil mechanisms is described in considerably more detail in co-pending application Serial No. 172,245 filed November 1, 1937, now Patent No. 2,203,093.

Slidably mounted in the runner tube 31 is a lead carrier having a tubular body 49 provided adjacent its upper end with a longitudinal closed slot 50. At the lower end of the slot 50 the material of the tube is bent outwardly with the outwardly bent parts in contact with each other to form a radially projecting lug 51. As shown in detail in Figures 12 and 13 the lug 51 has a generally oval cross-section and is preferably

provided with a closed end, although it is to be noted that the end of the lug may be left open so that the lug is of general oval tubular shape. At the juncture at the edge of the lug remote from the slot 50 a fillet 52 is provided which serves to strengthen the lug 51 and prevent its bending. It is to be noted that in addition to the strengthening function the fillet 52 also assists in causing the lug to fit snugly in the spiral slot 53 of the runner tube. As shown especially in Figure 2, when assembled with the remaining parts of the pencil the lug 51 extends through the slot 32 of the runner tube into engagement with the slot 53 of the actuating spiral. The pencil, according to the present invention, is also provided with a lead expeller comprising a bar-like body portion 54 having at its upper end a stepped lug 55. The lead expeller when assembled with the remaining elements of the pencil is mounted in the tube 49 with the lug 55 projecting through the slot 53 of the lead carrier and the slot 32 of the runner tube to engage in the slot 53 of the actuating tube. During normal operation of the pencil the lugs 51 and 55 normally engage the spiral at one convolution apart. The lower end of the lead carrier is preferably also provided with a flaring portion 52'. This assists the user of the pencil in the insertion of additional lead.

At the upper end of the actuating tube there is provided a pair of longitudinally aligned outwardly projecting bosses 56 and 57 of which the lower boss 57 is larger and/or has a greater outward projection than the boss 56. These bosses are adapted to cooperate with a driver tube which surrounds the upper end of the actuating tube in a manner to be hereinafter described. The driver tube is provided with a cylindrical upper part 58 for the reception of an eraser 59 and this driver tube is also provided with the lower tubular portion 60 having an outwardly struck longitudinal rib 61 the inner side of which forms a channel 62. The body of the portion 60 fits snugly on the upper end of the actuating tube 43 and the channel 62 slips over the boss 56 and engages against the boss 57 which thus limits movement of the driver tube longitudinally of the actuating tube and insures proper positioning of the driver tube on said actuating tube. Between the portions 58 and 60 of the driver tube there is provided a struck out rib 63 which engages in a shallow groove 64 formed around the interior of the barrel 20 at its upper end, the parts being sufficiently elastic to permit the driver tube to pass into the barrel for such engagement. Thus the driver tube is held from being detached from the actuating tube. On the driver tube are provided longitudinal lugs 65 and a cap 66 is removably fitted over the upper part of the driver tube and the eraser, this cap tightly engaging the lugs 65 so that rotation of the cap effects rotation of the driver tube and, through the latter effects rotation of the actuating tube.

In the operation of the device as the lead used therein wears away the cap 66 is rotated and, due to the spiral camming effect of the actuating tube on the lug 51, the lead carrier is fed downwardly and a new portion of the lead projected from the tip. When all of the lead capable of being used has been worn away the lug 51 will have passed into the chamber 45 and out of the slot 53 so that the lead carrier will no longer move forwardly. However, further rotation of the actuating tube will cause the lug 55 and the lead ejector 54 to move downwardly in the lead

carrier thus pushing the engaged portion of the lead out of the carrier and ejecting it from the tip. Upon rotating the cap 66 in the opposite direction the lug 55 will move upwardly as this lug never passed out of the slot 53. When the lug 55 moves toward the upper end of the slot 50 it will, due to the proportions of the construction, be just one convolution of the slot 53 above the lug 51 so that further movement upwardly of the lug 55 will cause similar upward movement of the lead carrier 49 and the parts will be restored to their normal position.

Although as shown in the drawing the portions 34 and 38 extending from the side edges of the runner tube slot are shown as in contact, it is obvious that they may be slightly spaced apart prior to the insertion of the runner tube into the bore of the tip in order to allow for manufacturing tolerance. If they are so spaced apart they will be forced together upon the insertion of the runner tube into the bore in the tip. When they are forced together the abutting lips on the portion 38 will prevent the overlapping of portion 34 as hereinbefore described.

We claim:

1. In a mechanical pencil, a tip having a stepped bore extending axially therethrough, a runner tube having one end fixed in said tip and having an upper portion of the bore in spaced concentric relation to the part adjacent the fixed end, an actuating tube surrounding the runner tube and having its lower end entering the upper portion of said bore, an anti-friction washer surrounding said actuating tube and resting on the upper end of the tip, a sleeve surrounding said actuating tube and resting on said washer, means limiting downward movement of the actuating tube through said sleeve, a sleeve mounted on the runner tube above the upper end of the actuating tube and held from upward movement on said runner tube, and an anti-friction washer interposed between said second sleeve and the upper end of the actuating tube.

2. A runner tube for mechanical pencils, said runner tube comprising a metallic tubular member having a slot extending from one of its ends, and means extending from each side of the slot and having abutting surfaces of a width greater than the normal thickness of the runner tube and adapted to prevent closure of said slot.

3. A runner tube for mechanical pencils, said runner tube comprising a metallic tubular member having a slot extending from one of its ends, and a pair of projecting portions extending from each side of the slot and having outwardly turned lips adapted to abut to prevent closure of said slot.

4. In a mechanical pencil, a lead holder consisting of a thin sheet of metal bent to form a tubular body with the side edges of the sheet abutting, said side edges having opposed cut-away portions forming a slot and having extended portions projecting outwardly in contact to form a lug provided with diagonal brace portions at its lower side.

5. In a mechanical pencil, an actuating tube having adjacent its upper end a pair of longitudinally aligned and outwardly projecting bosses, the boss remote from its upper end being larger than the other boss, and a driver tube embracing the upper end of the actuating tube and having a longitudinally extending groove of a size fitting the smaller boss and refusing the larger boss.

6. In a mechanical pencil, an actuating tube

having adjacent its upper end a pair of longitudinally aligned and outwardly projecting bosses, a driver tube embracing the upper end of the actuating tube and having a longitudinally extending groove of a size fitting the upper boss and refusing the lower boss, a circumferential rib on said driver tube, and a barrel fitting over said driver tube and having an internal groove receiving said rib.

7. A runner tube for mechanical pencils adapted to be immovably seated in the tip member of the pencil, said runner tube having a portion of its tip end provided with segments of circumferentially extending and longitudinally spaced grooves arranged in planes extending transversely to the axis of the tube, and longitudinally extending and outwardly projecting ribs at the ends of said grooves.

8. A runner tube for mechanical pencils adapted to be immovably seated in the tip member of the pencil, said runner tube comprising a tubular member having a slot extending from its tip end, said slot adjacent said end being closed by longitudinally spaced portions of the tube material extending from one side wall of the slot towards the other side wall thereof, and longitudinally extending and outwardly projecting ribs spaced circumferentially from said extended portions of the tube material.

9. A runner tube for mechanical pencils adapted to be immovably seated in the tip member of the pencil, said runner tube comprising a metallic tubular member having a slot extending from its tip end, which slot near said end is closed by circumferentially aligned longitudinally spaced portions of the tube material extending from the side walls of the slot towards each other and longitudinally extending and outwardly projecting ribs spaced circumferentially from said extended portions of the tube material.

10. A runner tube for mechanical pencils adapted to be immovably seated in the tip member of the pencil, said runner tube comprising a metallic tubular member having a slot extending from its tip end and having circumferential grooves formed on the opposite sides of the slot, the metal of the tube adjacent the wall of the slot extending transversely of the slot to close the slot, and longitudinally extending and outwardly projecting ribs at the ends of said grooves.

11. A runner tube for mechanical pencils adapted to be immovably seated in the tip member of the pencil, said runner tube comprising a metallic tubular member having a slot extending from its tip end and having aligned grooves formed on opposite sides of the slot, the metal of the tube adjacent the wall of the slot extending transversely of the slot to close the slot and longitudinally extending and outwardly projecting ribs at the ends of said grooves.

12. A runner tube for mechanical pencils adapted to be immovably seated in the tip member of the pencil, said runner tube comprising a metallic tubular member having a slot extending from its tip end and having segments of circumferential grooves formed on opposite sides of the slot, the metal of the tube adjacent the wall of the slot extending transversely of the slot to close the slot and longitudinally extending and outwardly projecting ribs at the ends of said grooves.

13. A runner tube for mechanical pencils adapted to be immovably seated in the tip member of the pencil, said runner tube comprising a metallic tubular member having a slot extend-

ing from its tip end and having a pair of opposed circumferentially aligned groove portions formed at the tip end of the opposite sides of the slot, the metal of the tube adjacent the wall of the slot in alignment with said groove portions extending transversely of the slot to close the slot, said extending portions having outwardly extending and contacting ends forming a longitudinal rib on said tube.

14. A runner tube for mechanical pencils adapted to be immovably seated in the tip member of the pencil, said runner tube comprising a metallic tubular member having a slot extending from its tip end and having a pair of opposed circumferentially aligned groove portions formed at the tip end on the opposite sides of the slot, the metal of the tube adjacent the wall of the slot in alignment with said groove portions extending transversely of the slot to close the slot, said extending portions having outwardly extending and contacting ends forming a longitudinal rib on said tube, said tube having other longitudinally extending ribs at the remote ends of the groove portions.

15. A runner tube for mechanical pencils adapted to be immovably seated in the tip member of the pencil, said runner tube comprising a tubular member having a slot extending longitudinally from its tip end, said slot having side edges provided with longitudinally spaced pairs of lips extending toward each other, at least one pair of said lips having outwardly turned contacting ends forming a longitudinal rib on said tube.

16. A runner tube for mechanical pencils adapted to be immovably seated in the tip member of the pencil, said runner tube comprising a tubular member having a slot extending longitudinally from its tip end, said slot having side edges provided with longitudinally spaced pairs of lips extending toward each other, one pair of said lips having outwardly turned contacting ends forming a longitudinal rib on said tube, said tube having other longitudinal ribs spaced circumferentially from the first rib.

17. A runner tube for mechanical pencils adapted to be immovably seated in the tip member of the pencil, said runner tube comprising a tubular member having a slot extending longitudinally from its tip end, a plurality of transversely extending ribs formed in the runner tube adjacent said slot, and a plurality of longitudinally extending ribs adjacent said first mentioned ribs.

18. In a mechanical pencil, a tip having a bore therein, a fixed member of the pencil mechanism held in said bore, a rotating member of said pencil mechanism extending into said bore, relatively telescoping lead carrying and ejecting members cooperating with said fixed and rotatable members to advance the lead, said telescoping members being normally fixedly spaced by portions of said rotatable member, and an outwardly struck boss on said rotatable member rotatably supported by said tip to space the lower end of said rotatable member from the bottom of said bore to permit disengagement of one of said telescoping members from said rotatable member to vary the distance between the telescoping members to eject lead.

19. In a mechanical pencil including a tip member at the lower end thereof, a longitudinally slotted runner tube and an actuating spiral movable relative to one another, relatively telescop-

ing lead carrying and ejecting members cooperating with the slotted runner tube and the actuating spiral to advance the lead, said telescoping members being substantially fixedly spaced by portions of said actuating spiral and means on said spiral adapted to be rotatably supported by said tip to space the lower end of said spiral from said tip to permit disengagement of one of said telescoping members from said spiral to vary the distance between the telescoping members to eject lead.

20. In a mechanical pencil, a lead holder, comprising a thin, tubular body, a lug projecting laterally therefrom and having a generally oval shape, and a relatively thin bracing fin extending

diagonally across the junction of the lower end of said lug and the tubular body.

21. In a mechanical pencil, a lead holder consisting of a thin sheet of metal bent to form a tubular body with the side edges of the sheet abutting, said side edges having opposed cutaway portions forming a slot, extended portions projecting outwardly from said side edges to form a lug extending laterally from the tubular body, and a relatively thin bracing fin extending diagonally across the junction of the lower end of said lug and the tubular body.

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