

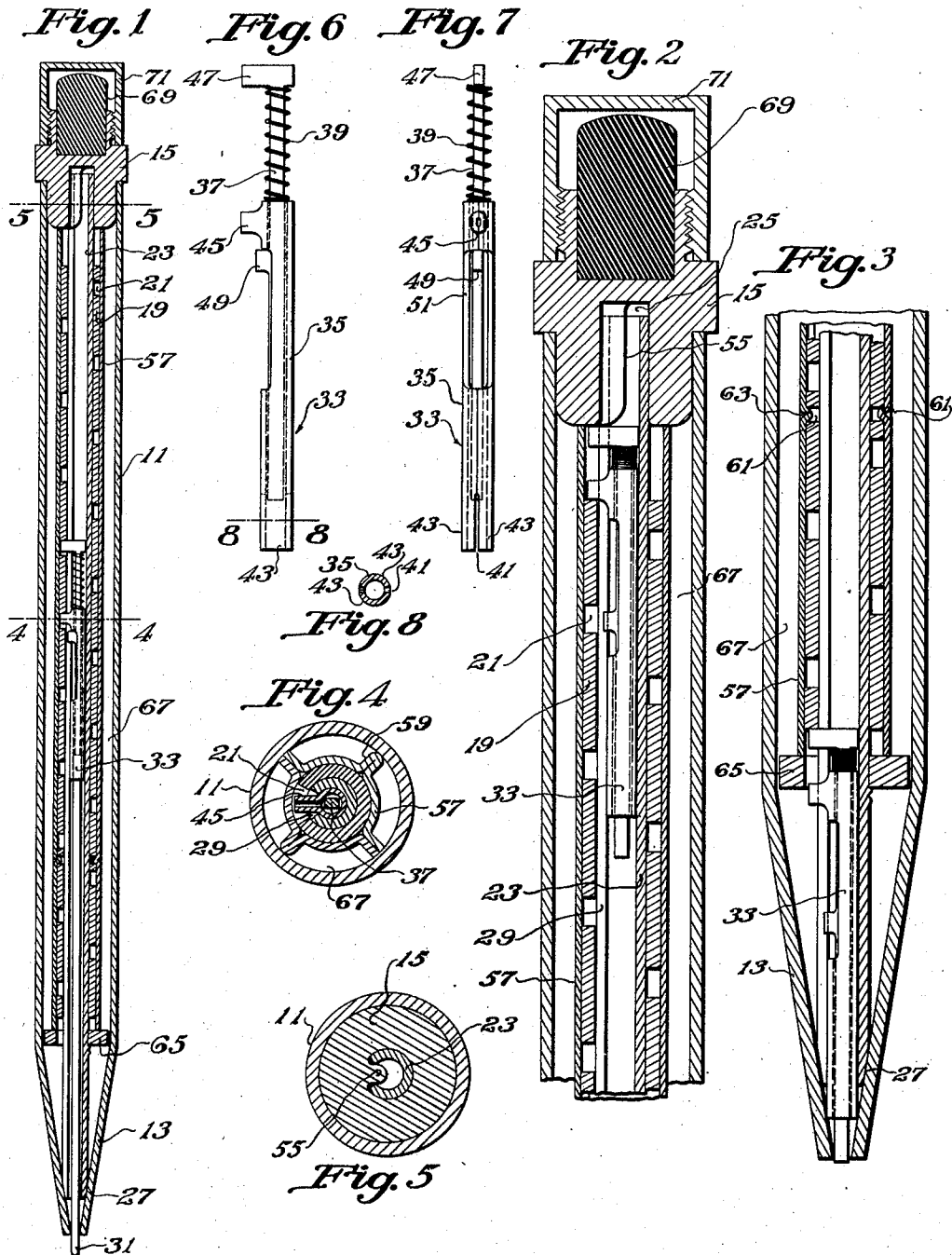
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The present invention relates to improvements in mechanical pencils in which the lead is advanced and retracted by mechanical devices within the pencil.

5 One of the objects of the present invention is to provide a simplified mechanism for advancing and retracting the lead which results in a reduced cost of manufacture, insures the operative parts from injury when at the limits of their advancing and retracting movements, and permits for the removal and replacement of the operative parts with facility and ease.

10 Another object of the present invention is to provide a pencil having a magazine or carrying space for additional leads extending substantially the length of the pencil to receive leads of similar length, access to such magazine being obtained merely by the removal of the usual cap or end closure.

15 A further object of the present invention is to provide a lead carrier unit which shall provide for over-running or ratchet action at the limits of its movement in projecting and retracting the lead, thus to insure the actuating mechanism from damage, which unit may be removed from or replaced in the pencil without disturbing other parts of the mechanism, and which furthermore is adapted to be inserted in the pencils now in common use in order to give them the over-running or ratchet action which they now lack.

20 With these objects in view, the present invention consists in the pencil herein described and more particularly defined in the claims.

25 In the accompanying drawing which illustrates what is now considered to be the preferred form of the present invention, Fig. 1 is a longitudinal sectional view of the assembled pencil; Figs. 2 and 3 are similar views on an enlarged scale of the upper and lower ends of the pencil, respectively; Figs. 4 and 5 are transverse sections on an enlarged scale at 4—4 and 5—5, respectively, of Fig. 1; Figs. 6 and 7 are elevations, on an enlarged scale, of the lead carrier unit removed from the pencil; and Fig. 8 is a transverse section on line 3—3 of Fig. 6.

30 The pencil shown in the drawing comprises the usual casing or barrel 11 having a tapered lower end portion 13 and at its upper end the cap 15 which is rotatable to actuate the lead projecting and retracting mechanism carried within the barrel. The cap is also removable to permit the removal and replacement of the lead carrier, and also to give access to the magazine or chamber which holds a supply of additional leads.

35 The mechanism for advancing and retracting

the lead comprises, briefly, a spirally grooved tubular member held in fixed position within the barrel, a guide tube rotatably mounted within the grooved member for guiding the lead carrier and lead, and a lead carrier longitudinally movable within the guide tube for carrying the lead and advancing and retracting the same through engagement with the grooved member.

40 The fixed grooved member 19 is conveniently formed by spirally winding a flat strip of metal with convolutions spaced apart to form the grooves 21. This member, it will be noted, terminates below the cap 15 at the top and above the tapered portion 13 of the barrel, to provide clearance spaces for a purpose shortly to be described.

45 Rotatably mounted within this fixed grooved member is the guide tube 23, the upper end of which extends slightly beyond the end of the barrel 11 and fits into a recess 25 in the cap 15, while the lower end extends into the tapered portion 13 of the barrel, and is slightly tapered, as at 27, to fit the barrel and give a bearing support for the end of the guide tube adjacent the point of the pencil. The guide tube is provided with a longitudinal slot 29 extending throughout its length. The tube may be formed by rolling a strip of thin metal into cylindrical shape with the longitudinal edges spaced slightly apart to form the slot.

50 Longitudinally movable within and guided by the guide tube are the pencil lead 31 and its carrier, indicated generally at 33. The carrier is made as a complete and separate unit, as shown in Figs. 6 and 7, which may be inserted in and removed from the pencil and the guide tube as a single part. The unit comprises a tubular member 35 for carrying the lead and fitting within and guided by the guide tube, a plunger 37 for ejecting the last bit of lead remaining in the carrier when the original lead is exhausted and a new lead is to be inserted, and a coil spring 39 for holding the plunger normally in retracting position.

55 The lead is held frictionally in the lower end of the tubular member 33, the latter being provided with opposite longitudinal slots 41 to form spring gripping jaws 43 for yieldingly gripping and holding the upper end of the lead. The upper end of the tubular member 33 is formed with a lateral extension 45 which is adapted to pass through the slot 29 of the guide tube and enter the groove 21 of the fixed member 19. When the guide tube is rotated, the lead carrier will be rotated with it through engagement of the extension with the walls of the longitudinal slot 29,

and at the same time will move longitudinally along the tube through engagement of the outer extremity of the extension with the groove 21 of the spiral member, thus advancing or retracting the lead, according to the direction of rotation of the guide tube.

The plunger 37 for ejecting the last bit of lead from the carrier is normally in the position as shown in Figs. 1 and 6, with its lower end at or about the ends of the slot 41 in the tubular member. A lateral extension 47 is provided on the upper end of the plunger to actuate the latter to eject the lead, this extension, like extension 45 on the tubular member, passing through the slot 29 of the guide tube 23 and entering the groove 21 in the member 19. Normally the plunger is held raised or retracted, as shown in Figs. 1, 6 and 7, by means of the coiled spring 39 which engages at its lower end the tubular member 33 and at its upper end the extension 47. A stop 49 extends laterally of the plunger midway its ends and, passing through the slot or cut-away portion 51 of the tubular member, limits the upward movement of the plunger under the action of the spring 39, normally holding the two extensions 45 and 47 on tubular member 35 and plunger 37 spaced apart the same distance as adjacent grooves 21 in the grooved member, both when the pencil is in use and when the lead is being advanced or retracted.

When, however, the carrier reaches the limit of its downward movement after the projection 45 has ridden out of the lower end of the groove 21 and into the clearance space, and the end of the member 35 has engaged the inner tapering wall adjacent the point of the pencil, continued rotation of the guide tube will advance the plunger in the now stationary tubular member and eject the lead from the clutch member 43, as shown in Fig. 3.

It will be noted that in this position continued rotation of the guide tube 23 will have no further effect upon the lead carrier or any of its parts so that damage to the same through continued turning of the cap and guide tube is impossible. On reverse rotation of the cap and tube, the compressed spring 39 will cause the projection 47 to enter the groove 21 of the stationary grooved member, and after a full reverse rotation, the stop 49 on the plunger will have engaged the end of the slot 51 in the tubular member, and further rotation will cause the projection 45 to enter the groove and the lead carrier to be raised in the guide tube.

In a similar manner, the coil spring 39 in the plunger will be compressed when the end of the plunger contacts with the lower face of the cap, as shown in Fig. 2, permitting the carrier to continue its upward movement until the projection 45 rides out of the groove and into the clearance space so that no further upward movement will take place upon continued rotation of the cap and tube. When the direction of rotation is reversed, the projection 45 is caused to enter the open end of the groove, and after a complete rotation, the projection 47 in the plunger follows suit.

Thus the construction of the lead carrier unit not only secures the ejection of the last bit of unused lead, but also protects the mechanism from injury at the limit of the carrier's motion in both upward and downward directions.

A simple and inexpensive way of constructing the tubular member 33 of the carrier unit is to form it from a piece of thin flat metal, died out

in proper shape to provide extensions 45, cut-away portion 51 and slots 41. The final closing of the member in the tubular form will be delayed until after the plunger with its spring and stop have been assembled in proper position within the member.

In order to provide for a positive driving connection between the upper end of the guide tube and the cap 15 the latter, which preferably will be formed of Bakelite or other suitable moldable material, will be formed with a rib or key 55, to enter the slot 29 in the upper end of the tube.

The grooved member 19 is secured in fixed position within the barrel by means of a surrounding casing 57 having longitudinal flanges 59 which frictionally engage the inner face of the barrel and fixedly position the casing and member therein. To supplement the frictional engagement of the casing on the member, the latter has been provided with diametrically opposite recesses 61 into which extend the projections 63 formed on the casing wall.

A convenient and inexpensive form of casing is that shown in Fig. 4 consisting of two semi-cylindrical sections pressed from thin flat material into the desired curved shape, with portions bent or folded outwardly to form flanges.

The casing, being of substantially smaller diameter than the interior of the barrel, leaves a space between the two parts which is available as a chamber to hold a supply of extra leads, the bottom of such chamber being closed by a disk frictionally secured upon the guide tube immediately above the tapered portion 13 of the barrel. Thus a long chamber or series of chambers 67 is provided, extending substantially the length of the barrel, and adapted to receive a supply of extra long leads. This is a feature of importance as it minimizes waste of lead and loss of time in renewal.

The cap is provided with the usual rubber eraser 69, with the projecting supplementary cap 71.

In assembling the pencil herein shown and described, the semi-cylindrical casing members 57 are positioned upon the grooved member 19 with the projections 63 on the former entering the recesses 61 on the latter. The guide tube is then passed upwardly through the grooved member until the disk 65 engages the bottom of the casing. These assembled parts are then inserted in the barrel, the flanges 59 guiding and positioning them as they are pushed downwardly until the tapered end 27 of the guide tube finds bearing on the inner face of the tapered portion 13 of the barrel. The lead carrier unit is next inserted in the guide tube with the projections 45 and 47 passing through the slot 29 thereof. The cap is now positioned upon the projecting end of the guide tube with the tongue or key 55 entering the slot 29. With these parts in alignment, the lower end of the cap is inserted in the upper end of the barrel and pushed downwardly into the position shown in Fig. 2, and the assembly is completed.

To insert a lead for the first time in the assembled pencil, the cap is rotated sufficiently to move the carrier downwardly in the guide tube until the plunger in the latter stands retracted, as in the position shown in Figs. 6 and 7. The lead may now be inserted through the tapered end of the pencil and the guide tube, the end of the lead being forced gently into the lower end of the carrier where it will be gripped by the jaws 43. Rotation of the cap will now advance or retract the lead according to the direction of rotation, and

the desired length of lead projecting from the end of the pencil will be secured in the usual manner by proper rotation of the cap. From time to time as the lead wears away, it may be advanced slightly

5 by rotating the cap until finally, as the parts reach the position shown in Fig. 3, the last unused bit of lead is ejected from the pencil.

To renew the lead, a slight reverse rotation is given the cap, the end of the plunger being there-
10 by withdrawn within the carrier; the cap is then removed, a new lead taken from the magazine or supply chamber 67, the cap replaced, and the end of the lead entered in the carrier, whereupon the cap will be reversely rotated to draw the lead
15 upwardly into the pencil to give the desired projection or length of pencil point.

Due to the fact that the lead carrier has a rotational movement as it advances down the guide tube, a corresponding rotation is imparted to the
20 lead itself so that each time the lead is advanced by rotation of the cap, it is also rotated, thereby bringing a new and unflattened portion at its end into contact with the paper or other material upon which the lead bears. Thus, the point of lead is
25 automatically sharpened, as it were, as fast as it wears down.

With mechanical pencils as heretofore constructed it has been found that the part most likely to require repair or replacement is the lead
30 carrier, and when it is desired to remove or replace this portion of the mechanism in the present pencil it is only necessary to bring the carrier to the position shown in Fig. 2 and remove the cap, when the carrier unit may be easily and quickly taken
35 out and a new one inserted. So also if the lead jams in the guide tube, the lead carrier may be quickly removed as above described and a small drill or wire passed through the tube to remove the obstruction.

40 Certain types of pencil now in commercial use have no provision for securing the protecting over-running or ratchet action at the limits of the upward and downward movement of the lead carrier, and in these pencils it is only necessary to
45 remove the old carrier and insert the unit herein shown to secure this desirable freedom from possible damage, the other parts of the mechanism being such as to operate properly with such carrier unit.

50 While the accompanying drawing illustrates what is now considered to be the preferred embodiment of the present invention, it is to be understood that the invention is not limited to the exact forms and arrangements therein shown except
55 where so specifically set forth in the appended claims, but may be embodied in other forms and arrangements within the scope thereof.

Having thus described the invention, what is claimed is:

60 1. A mechanical pencil comprising a barrel, lead advancing and retracting devices within the barrel including a fixed, spirally grooved tubular member and a lead carrier mounted for rotational and longitudinal movement within the same, and
65 a fixed casing surrounding the grooved member, the casing comprising semi-cylindrical sections provided with external longitudinal flanges frictionally engaging the inside of the barrel, the grooved member and the sections having cooper-
70 ating projections and recesses for holding said member and sections from relative movement.

2. A mechanical pencil comprising a barrel, a spirally grooved, tubular member fixed within the barrel, a longitudinally slotted guide tube rotat-
75 ably mounted within said member, a lead carrier

slidingly mounted within the guide tube and having means for engaging the slot in said tube and the groove in said member, and a removable cap engaging the guide tube with a sliding fit for closing the end of the barrel and the guide tube for
5 retaining the lead carrier in said tube and for affording access to the said tube to permit removal of the carrier upon removal of said cap.

3. A mechanical pencil comprising a barrel, a spirally grooved, tubular member fixed within the barrel, a longitudinally slotted guide tube rotat-
10 ably mounted within said member, a lead carrier slidingly mounted within the guide tube and having means for engaging the slot in said tube and the groove in said member, and a removable cap
15 engaging the guide tube with a sliding fit for closing the end of the barrel and the guide tube for retaining the lead carrier in said tube, the tube projecting beyond the end of the barrel to facilitate assembly of the parts.

4. A mechanical pencil comprising a barrel, a spirally grooved, tubular member fixed within the barrel, a longitudinally slotted guide tube rotat-
20 ably mounted within said member, a lead carrier slidingly mounted within the guide tube and having means for engaging the slot in said tube and the groove in said member, and a removable cap for closing the end of the barrel for retaining the
25 lead carrier in said tube, the cap having a portion of reduced diameter to fit within the end of the barrel, and a central recess within such portion to receive with a sliding fit the end of the guide tube in actuating engagement whereby rotation of the
30 cap will rotate said tube.

5. A mechanical pencil comprising a barrel, a spirally grooved, tubular member fixed within the barrel, a longitudinally slotted guide tube rotat-
35 ably mounted within said member, a lead carrier slidingly mounted within the guide tube and having means for engaging the slot in said tube and the groove in said member, and a cap on the end of the barrel for rotating the guide tube and for closing the end of the barrel and the guide
40 tube to retain the lead carrier in said tube, the tube projecting beyond the end of the barrel, and the cap having a portion of reduced diameter to fit within the barrel and a central recess in such
45 portion to receive with a sliding fit the end of the tube, whereby in assembling the tube may be entered in said recess before said portion is entered
50 in the barrel.

6. A mechanical pencil comprising a barrel, a lead carrier and actuating devices for the carrier, said devices including a longitudinally slotted
55 guide tube and a spirally grooved member, one of said devices being rotatably supported relatively to the barrel, and a removable closure for the end of the tube and member engaging the guide tube with a sliding fit to permit removal of the carrier therefrom.

7. A mechanical pencil comprising a barrel, a lead carrier and actuating devices for the carrier, said devices including a longitudinally slotted
65 guide tube and a spirally grooved member, one of said devices being rotatably supported relatively to the barrel, and a cap for closing the ends of the barrel, tube, and member, said cap being removable by sliding movement to uncover the ends of the barrel, tube, and member to permit removal of the carrier from the tube.

8. A lead carrier unit for mechanical pencils comprising a tubular member having provision at one end for holding a lead and a lateral projection adjacent the other end for actuating the member, the member having a longitudinal guide
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- slot, a plunger slidingly mounted in the member and projecting beyond the end of the same for ejecting the lead from the member, the plunger being provided with a lateral actuating extension on its projecting portion without the member and a guide positioned in the slot in the tubular member, and a coiled spring encircling the projecting portion of the plunger for yieldingly holding the plunger in retracted position.
9. A lead carrier unit for mechanical pencils comprising a tubular member having provision at one end for holding a lead and a lateral projection adjacent the other end for actuating the member, said member having a longitudinal guide slot, a plunger slidingly mounted in the member and projecting from the end thereof for ejecting the lead from the member, the plunger being provided with a lateral actuating extension on its projecting portion without the member and a stop positioned in the slot in the member for limiting the movement of the said plunger in the retracted direction, and a coiled spring encircling the projecting portion of the plunger without the member and engaging at one end the end of the member and at the other the extension on the plunger for normally holding the plunger yieldingly at the limit of its retracted movement.
10. A lead carrier unit for mechanical pencils comprising a tubular member having provision at its forward end for holding a lead and a lateral projection adjacent the rear end for actuating the member, the member having a longitudinally extending slot and a plunger slidingly mounted in the member and projecting beyond the rear end of the same for ejecting the lead from the member, the plunger being provided with a lateral actuating extension on its projecting portion without the member and a supplemental projection located in the slot for positioning the plunger and its actuating extension angularly about its longitudinal axis with respect to the member.
11. A lead carrier unit for mechanical pencils

comprising a tubular member having provision at its forward end for holding a lead and a lateral projection adjacent the rear end for actuating the member, the member having a longitudinal slot closed at its rear end, a plunger slidingly mounted in the member and projecting beyond the end of the same for ejecting the lead from the member, the plunger being provided with a lateral actuating extension on its projecting portion without the member and a supplemental projection arranged to engage the closed end of the slot to limit rearward movement of the plunger, and a spring for yieldingly holding the plunger in rearward position.

12. A mechanical pencil comprising a barrel, a spirally grooved, tubular member fixed within the barrel, a longitudinally slotted guide tube rotatably mounted within said member, a lead carrier slidingly mounted within the guide tube, the carrier comprising a tubular member having provision at one end for gripping the lead and a projection at the other end extending through the slot in the guide tube and into the groove of the spirally grooved member and having a longitudinal slot in its wall with a closed end, a plunger slidingly mounted in the lead carrier and having a lateral projection extending through the slot of the guide tube and into the groove of the spirally grooved member for actuating the plunger to eject the lead from the lead carrier, the plunger having a supplemental lateral projection extending into the slot in the lead carrier in position to engage the end of said slot to limit the rearward movement of the plunger in the lead carrier, the supplemental projection on the plunger being positioned to space the projections on the lead carrier and on the plunger the predetermined distance apart for proper engagement with the grooves of the spirally grooved member, a spring for yieldingly holding the plunger in retracted position, and means for rotating the guide tube.

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