May 23, 1950 R. J. LYNN 2,509,006

MECHANICAL PENCIL WITH LEAD STORAGE MAGAZINE

Filed Aug. 14, 1948

Fig. 1

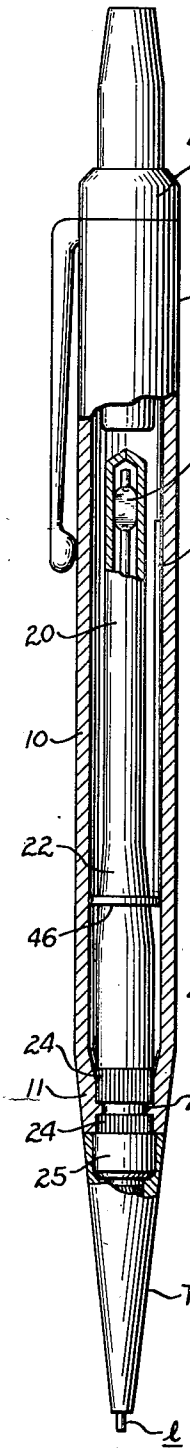


Fig. 4



Fig. 2

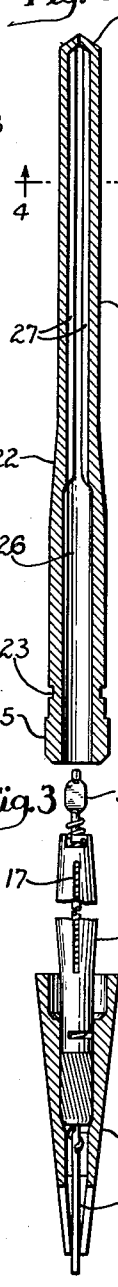


Fig. 3

Fig. 9

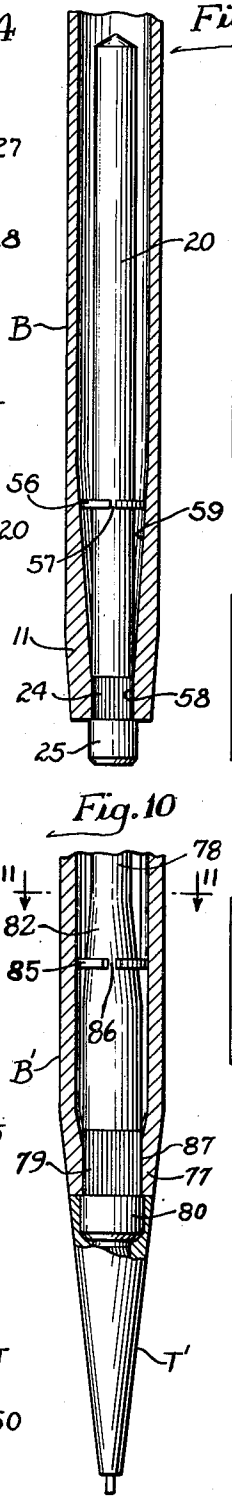


Fig. 10

Fig. 5

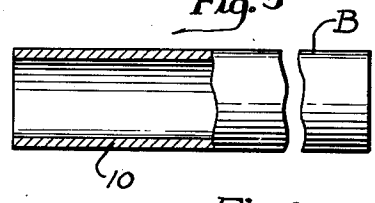


Fig. 6

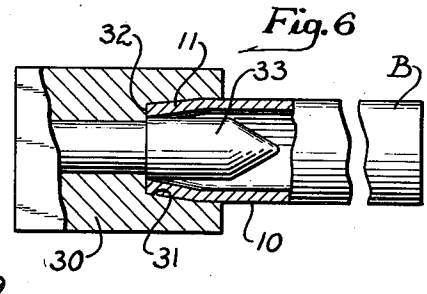


Fig. 7

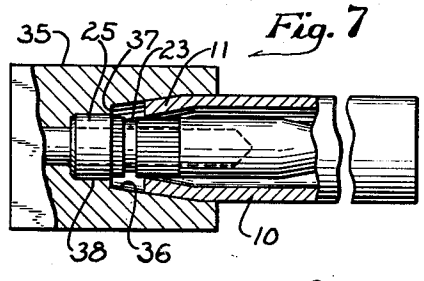


Fig. 8

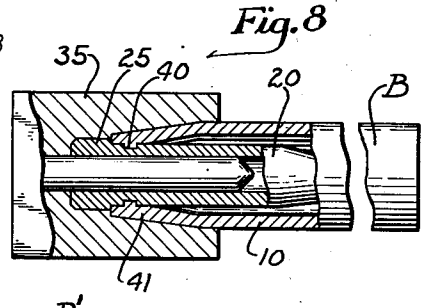
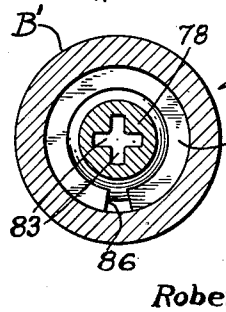


Fig. 11



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MECHANICAL PENCIL WITH LEAD STORAGE MAGAZINE

Robert J. Lynn, Chicago, Ill.

Application August 14, 1948, Serial No. 44,355

11 Claims. (Cl. 120—14.9)

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My invention relates to a mechanical pencil in which is combined a chambered body to which is fitted a tip which mounts a propelling mechanism. In the present pencil this tip is removable from the pencil body, together with the propelling mechanism which constitutes a unit therewith. When fitted to the body of the pencil, the tip has capacity for relative rotation whereby to operate the propelling mechanism.

The features of invention with which I am here concerned relate to the provision within the chambered pencil body of a guide tube adapted for cooperation with the propelling mechanism of the tip, and to the means and method whereby this guide tube may be anchored fixedly in place. This tube is extended axially within the pencil body which is also in the form of a tube. The anchorage between the two tubes is confined to a short distance at or near the lower ends thereof. Elsewhere an annular space intervenes between the tubes, available as a magazine for the storage of reserve leads which may be put in or taken out through the top end of the body tube whenever a closure cap at that point is removed.

A substantial saving in time and cost may be effected by utilizing for the body and guide tubes a suitable composition material which is moldable under heat and pressure. These two tubes which initially are separate and independent become, in the process of their assembly, united mechanically and in a way which is immovable, inseparable, and permanent, one with respect to the other. The result is a pair of tubes, one within the other, spaced apart for their full length except at their lower ends where one is united to the other, and each embodying such special features of contour or cross section as may be desired for most effective cooperation with the lead propelling mechanism which is comprised in the operating tip.

This invention is also concerned with the provision at a point spaced from the union of the tubes at or near their lower ends of a second means of connection therebetween, and of the method employed in making such connection. This second point of connection utilizes an expansible ring fitted into an annular space between the two tubes and adapted to be wedged radially inwardly or outwardly into an expanded state in response to insertion of one tube axially within the other tube. Such an expansible ring is then maintained fixedly and permanently in a predetermined position where it may also serve as a bottom closure for a spare-lead magazine in the upper end region of the pencil.

Certain suggestive embodiments of this invention are illustrated in the accompanying drawing in the manner following:

Figure 1 is an elevational view of the pencil

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partly broken away to exhibit in longitudinal section the body of the pencil together with the guide tube positioned therewith;

Fig. 2 is a longitudinal section through the guide tube as it appears before its assembly with the pencil body;

Fig. 3, which is a longitudinal section through the tip unit separated from the pencil, shows in elevation the coupling tube anchored thereto;

Fig. 4 is a transverse section through the guide tube, taken on line 4—4 of Fig. 2;

Fig. 5 is a view, partly in longitudinal section and partly in elevation, of the tube as it appears before it is formed into the body of the present pencil;

Fig. 6 which is a detail in longitudinal section shows the body tube in the first stage of the molding treatment prior to assembly of the guide tube therewith;

Fig. 7 is a similar view showing the body and guide tubes in their relative positions at the commencement of the second stage of the molding treatment in the process of their assembly.

Fig. 8 which is a similar view shows the body and guide tubes in their relative positions at the conclusion of the second stage of this molding treatment;

Fig. 9 is an elevational view of a slightly different lead guide tube assembled within a modified tubular pencil body whose lower end portion is here shown in longitudinal section;

Fig. 10 is a fragmentary view in elevation, and partly in section, of a modified pencil wherein the body and lead guide tube are secured together by means somewhat different from that which is elsewhere shown; and

Fig. 11 is a transverse section, taken on line 11—11 of Fig. 10.

The pencil of my invention comprises a tubular body B having walls 10 of generally cylindrical contour for the major part of its length, and produced desirably from a suitable composition material which is susceptible of being molded to shape under the influence of heat and pressure. Near its lower end the body walls are tapered inwardly at 11 for a short distance. At this point is the juxtaposed socketed large end of a tapered tip T through which is an axial chamber accommodating a coupling tube 15 whose lower end is fixedly anchored to the tip in any approved way. This coupling tube which extends upwardly and outwardly beyond the top end of the tip may be longitudinally slitted at 17 at distances of perhaps 120° apart to provide therebetween arcuate sections which are outwardly bowed endwise, whereby these circumferentially bulged sections become radially resilient for a purpose which will shortly appear.

A primary feature of this invention is the provision of a guide tube 20 fixedly carried within

the chambered body B in spaced relation to its surrounding walls and in operative relation to a lead propelling mechanism which is carried by the tip T. This guide tube, as shown, may be produced from a composition material. Exteriorly its form is cylindrical throughout its upper end region with a smaller diameter which then tapers outwardly to provide a shoulder 22 in its medial region, and then continues through its lower end region where it changes to another diameter which is slightly enlarged except for a circumferential groove 23 near its lower end. The exterior surface of the tube contiguous to both sides of this groove is desirably knurled at 24, and therebelow the tube is shown as very slightly increased in diameter to provide a head 25 which is cylindrical and smooth. Interiorly the axial chamber of the tube is cylindrical, as at 26, throughout its lower end region (see Fig. 2), but opposite its tapered walls 22 this chamber changes form to provide opposed slots 27 which continue to its top end which is desirably closed by a wall 28.

A guide tube of this general description may be fixedly anchored within the body B in a very effective and simple way. As suggested in Fig. 6, the tubular body which is made from composition material is initially cylindrical with its walls 10 of uniform thickness. To adapt the body tube for reception of the guide tube therewithin, I employ a die 30 having at one end a socket whose walls are tapered inwardly at 31. An outwardly facing annular shoulder 32 provides a terminus for the tapering walls beyond which is an axial bore wherein is accommodated the shank of a sizing mandrel 33 that is projected outwardly into the die socket. By forcing the tubular body endwise into the die socket, while heated, up to the shoulder 32, the tube will be coned inwardly adjacent its end to provide tapered walls of short length (see Fig. 7) which progressively increase in thickness very slightly toward the tube end. In this operation the sizing mandrel acts to assure a predetermined internal diameter of the tube at its extreme end.

After this initial tapering of the body end has been effected, the tube is then fitted into a second die 35 (Fig. 8) having at one end a socket whose walls are tapered inwardly at 36 as far as an outwardly facing annular shoulder 37 beyond which the socket continues in the form of a cylindrical chamber 38 having a diameter and length the same as that of the head 25 at the lower end of the guide tube 20. An axial bore continues on through the die for accommodation of a guide mandrel 39 which is extended outwardly into the die socket. The guide tube, already in the form and shape illustrated in Figs. 1 and 2, is then assembled with the body tube, and the two tubes so interfitted are advanced into the socket of the mold 35 which is heated. The guide tube readily reaches its final position wherein its head 25 occupies the cylindrical chamber 38, but the short tapered end walls 11 of the body tube engage the tapered walls 36 of the die a substantial distance before reaching the annular shoulder 37 (see Fig. 8). From and after this point the further endwise advance of the body tube is dependent upon heat and pressure which is applied in the requisite degree to flow the already thickened walls of the body tube lengthwise over the knurled portion 24 and into the circumferential groove 23 of the guide tube 20 (see Fig. 9). In this final operation the tapered walls 11 of the body are caused to interengage positively with the knurls of the guide tube so as to lock one against axial movement relative to the other. The body walls, at their point of juncture with the guide tube, remain slightly thicker than elsewhere whereby to provide a union of ample strength. In this final condition of assembly the body and guide tubes are inseparably, immovably, and permanently interlocked, as clearly shown in Figs. 1 and 9.

The annular space between the body and guide tubes provides a magazine which may be utilized for extra leads *l* which are placed therein and removed therefrom through the open top end of the body tube which is normally closed by a closure 45 which may take the form of an eraser unit the details of which are unimportant here. A bottom for the magazine may conveniently be provided by a ring 46 which may be frictionally fitted upon the shoulder constituted by the tapering walls 22 of the guide tube to remain in a fixed position thereupon. This ring may optionally have an outside diameter sufficiently large to engage the surrounding body walls.

When the tip unit is operatively fitted to the lower end of the pencil body, its coupling tube 15 is entered into the guide tube 20 for a distance insufficient to reach its tapering walls 22; in this assembled condition the bowed sections between the slits 17 resiliently engage the surrounding walls of the guide tube whereby to establish a frictional, yet separable, connection therewith, and one which permits the tip to be rotated relative to the pencil body. The coupling tube mounts a lead propelling mechanism including a plunger 50 having at its top a head 51 which is flattened to enter into a pair of opposed slots 27 in the upper end region of the guide tube 20. In response to rotation of the tip upon the body the plunger is caused to travel endwise whereby to propel an active lead *l* outwardly through the small end of the tip where it is frictionally supported in writing position. When assembled with the pencil body, the axial socket at the upper end of the tip receives the guide tube head 25 in close fitting relation, whereby to steady and maintain the one part axially with respect to the other independently of the lateral support which is afforded by the coupling tube.

Referring now to Fig. 9, the showing here is substantially identical with that in Fig. 1 except in four particulars, viz., the ring 56 is split at 57 so as to be expansible; the knurled portion 24 of the lead guide tube 20 is not interrupted by any circumferential groove such as the one designated as 23 in Figs. 1 and 2; the lead guide tube is of uniform external diameter from a point beyond the head 25 at its lower end; and the tapered lower end 11 of the pencil body B, which is interiorly cylindrical at 58 for a distance substantially the same as the length of the knurled portion 24 of the lead guide tube, is tapered outwardly at 59 for a substantial distance upwardly from this point.

In the assembly of the pencil of Fig. 9 the expansible ring 56 is fitted loosely around the lead guide tube 20 along which it descends until engagement takes place with the tapered interior surface 58 near the lower end of the tubular pencil body. At this stage the lead guide tube which already has been entered through the lower end of the pencil body is advanced freely therein until its knurled portion 24 encounters the lower end of the body; at this point opposed endwise pressures are directed against the lead guide tube and the pencil body, whereby to force the one axially

with respect to the other. In this operation the knurled portion 24 is forced to final position within the pencil body by forming therein small grooves in parallelism with each other and with the axis of the body. The forced fit thus provided is permanent.

At the same time and during this same operation, the expansible ring may be forced endwise along the interiorly tapered walls 59 of the body to be wedged thereby inwardly into pressure engagement with the lead guide tube. In its final position, as shown in Fig. 9, the ring will provide an interlocking connection between the body and lead guide tube at a point remote from the interlocking connection which is provided by the forced fit of the knurled portion 24 of the lead guide tube within the cylindrical wall 58 of the tubular body. Accordingly the two tubes are coaxially secured together, but in spaced relation, except at the bottom end of the pencil, so as to be adequately and permanently supported in fixed positions relative to each other.

Referring now to Figs. 10 and 11, I have there illustrated a hollow pencil body B' having its walls tapered inwardly at 77 for a short distance at the lower end. At this point is the juxtaposed socketed large end of a tapered tip T' wherein is fitted a guide tube 78 having a knurled lower end portion 79 below which is a slightly enlarged head 80. Within this tube is accommodated a lead propelling mechanism that may, if desired, be the same as the one already described in connection with the construction of Figs. 1–4.

Exteriorly the guide tube 78 is cylindrical in form throughout its upper end region, with a smaller diameter in its medial region which tapers outwardly to provide a shoulder 82. The axial chamber interiorly of the guide tube changes form in the region of the tapered shoulder to provide opposed slots 83 for engaging with the flattened head of the lead propeller (not shown) in the manner already explained. A ring 85 which is fitted around the guide tube is slidable lengthwise thereupon to a position of rest against the tapered shoulder 82. This ring is split at 86 so as to be expansible.

In the assembly of the pencil of Figs. 10 and 11, the expansible ring 85 may be rested upon the upper end of an upright tubular fixture over which is placed the tubular body B' with the guide tube 78 loosely fitted therewithin. By a relative axial movement of these parts, the smaller upper end region of the guide tube 78 is advanced freely within the expansible ring up to the point of engagement therewith of its tapered portion 82; concurrently the guide tube 78 is advanced upwardly within the tubular body B' so as to force its knurled portion 79 endwise within the cylindrical chamber 87 at the tapered lower end of the pencil body. In this operation two things happen: (1) the tapered wall portion 82 of the guide tube 78 acts as a circular wedge to expand the ring 85 outwardly into tight engagement with the surrounding body walls, and (2) the knurled portion 79 forces its way to final position within the pencil body by forming upon the inner surface of the cylindrical chamber at its lower end complementary grooves in parallelism with each other and with the axis of the body. Such an interfit of the parts results from an endwise forcing of the lead guide tube 78 relative to the expansible ring 82 and the tubular body B' of the pencil. It produces a normally inseparable interlock at two spaced points between the lead guide tube and the body, and may

be relied upon to resist effectively any possible relative rotary or endwise movements between these parts.

It is desirable, for the purposes of this invention, that the body tube be made of some composition material—a plastic, it is usually termed. The material of which the guide tube is made is optional—it may be plastic or metal. Also the special exterior formation which characterizes the guide tube at its lower end may be modified within certain limits so long as its exterior embodies one or more definitely raised or sunken features with which the surrounding body tube, when inwardly disposed, may positively engage on all sides. When assembly is finally completed in the manner heretofore described, there will be a positive interlock between the body and guide tubes at one or more places such as to prevent any motion or separation between these parts. The anchorage thus afforded is very effective indeed, it assures a maintenance of the guide tube in a position centrally of the body tube, and there is no deformation exteriorly of the body tube required for the inward displacement of its walls for engagement with the guide tube at the point where the anchorage is located.

This is a continuation in part case in respect of my application filed February 17, 1947, under Serial No. 729,111, now abandoned.

I claim:

1. In a pencil, the combination with a separable propelling unit of an associated plastic tubular body having straight walls of uniform thickness but tapered inwardly and thickened at its lower end, and a guide tube within the tubular body spaced from the walls thereof to afford therebetween an annular magazine open only at the pencil top, the guide tube being extended below the lower end of the body for supporting rotatable engagement with the propelling unit when the latter is fitted operatively to the tapered pencil end, and coacting means integral with the body and guide tube providing an interlocking connection therebetween, confined to the tapered and thickened wall region of the body, adapted to sustain the guide tube fixedly and inseparably within the body tube, centrally thereof.

2. In a pencil, the combination with a separable propelling unit of an associated plastic tubular body having straight walls of uniform thickness but tapered inwardly and thickened at its lower end, and a guide tube within the tubular body spaced from the walls thereof to afford therebetween an annular magazine open only at the pencil top, and coacting means integral with the body and guide tube providing an interlocking connection therebetween, confined to the tapered and thickened wall region of the body, adapted to sustain the guide tube fixedly and inseparably within the body tube, centrally thereof.

3. In a pencil, the combination with a separable propelling unit of an associated plastic tubular body having straight walls tapered inwardly at its lower end, and a guide tube within the tubular body spaced from the walls thereof to afford therebetween an annular magazine open only at the pencil top, and coacting means integral with the body and guide tube providing an interlocking connection therebetween, confined to the tapered wall region of the body, adapted to sustain the guide tube fixedly and inseparably within the body tube, centrally thereof.

4. In a pencil the combination of a tapered tip, a plastic chambered pencil body substantially

straight from end to end except at its lower end where the body is tapered inwardly to a diameter substantially the same as the larger end of the tip, and at an inclination substantially the same as the taper thereof, a guide tube extended centrally within the body chamber and into the tip for rotative engagement thereby, an anchorage for the guide tube confined to the region of the tapered lower end of the body comprising means on the guide tube extending at varying distances from its axis interengaged by plastic material extended inwardly from the body walls, and means fixed to the tip extending into the guide tube for frictional engagement therewith for establishing a separable rotatable connection therewith.

5. In a pencil, the combination with a separable propelling unit of an associated plastic tubular body having straight walls of uniform thickness but tapered inwardly and thickened at its lower end, and a guide tube of plastic material within the tubular body spaced from the walls thereof to afford therebetween an annular magazine opening only at the pencil top, the guide tube being extended below the lower end of the body to enter into the propelling unit when fitted operatively to the tapered pencil end, and coacting means integral with the body and guide tube providing an interlocking connection therebetween, confined to the tapered and thickened wall region of the body, adapted to sustain the guide tube fixedly and inseparably within the body tube, centrally thereof.

6. In a pencil, the combination with a separable propelling unit, of an associated plastic tubular body having its walls at the lower end tapered inwardly and thickened, and a guide tube within the tubular body spaced from the walls thereof to afford therebetween an annular magazine open only at the pencil top, the guide tube being provided at one point intermediately of its ends with an upwardly facing shoulder, a ring fitted over the upper end portion of the guide tube and adapted to rest upon the shoulder to occupy substantially fully the annular space between the guide tube and the tubular body of the pencil whereby to provide a bottom for the magazine, and means providing an interlocking connection between the body and guide tubes, confined to the tapered and thickened wall region of the former adapted to sustain the guide tube fixedly and inseparably within the body tube, centrally thereof.

7. In a pencil, the combination with a separable propelling unit, of an associated plastic tubular body having its walls tapered inwardly and thickened at its lower end, a guide tube within the tubular body spaced from the walls thereof to afford therebetween an annular magazine open only at the pencil top, and coacting means integral with the body and guide tube providing an interlocking connection therebetween, confined to the tapered and thickened wall region of the body, adapted to sustain the guide tube fixedly and inseparably within the body tube, centrally thereof.

8. In a pencil, the combination with a separable propelling unit, of an associated tubular body and a guide tube within the tubular body spaced from the walls thereof, the guide tube being provided exteriorly with a shoulder tapering inwardly towards its upper end, and an expansible ring fitted upon the guide tube shoulder to be outwardly wedged thereby when advanced downwardly thereupon, the ring, when expanded, being arranged to engage with pressure the inside surface of the pencil tubular body whereby to provide an interlocking connection between the pencil body and guide tube.

9. In a pencil, the combination with a separable propelling unit, of an associated tubular body having a smaller inside diameter at one end, a lead guide tube within the tubular body spaced from the walls thereof, said guide tube having a diameter at one end substantially equal to the reduced inside diameter at the proximate end of the tubular body and being formed with knurls longitudinally disposed to enter into complementary grooves in the tubular body whereby to provide a frictional and positive interlocking connection between the body and guide tube at that point, the guide tube at a point intermediately of its ends being formed exteriorly with an endwise tapering shoulder, and an expansible ring fitted upon the shoulder and arranged to be outwardly wedged thereby into pressure engagement with the tubular body walls to provide a second interlocking connection between the body and guide tube at a point spaced from the first interlocking connection therebetween.

10. In a pencil, the combination with a lead propelling tip unit, of an associated tubular body, a lead guide tube within the body tube coaxial therewith and throughout its upper end portion spaced from the walls thereof, means adjacent the lower end of the pencil body integral with one tube and extending toward the other tube and engageable therewith in coacting relation and in response to axial movement of one tube relative to the other whereby to establish an interlocking connection therebetween, one of the two tubes at a point removed from the interlocking connection being formed with a tapered shoulder whereby to vary the distance between the two tubes, and a split ring disposed between the two tubes and fitted around the tapered shoulder of the one tube adapted in response to relative axial movement therewith to be wedged radially toward the other tube for pressure engagement therewith whereby to establish a frictional lock between the two tubes at a point remote from the lower end of the pencil body.

11. In a pencil, the combination with a lead propelling tip unit, of an associated tubular body, a lead guide tube within the body tube coaxial therewith and throughout its upper end portion spaced from the walls thereof, and means adjacent the lower end of the pencil body integral with one tube and extending toward the other tube and engageable therewith in coacting relation and in response to axial movement of one tube relative to the other whereby to establish an interlocking connection therebetween.

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