April 4, 1950 I. D. TEFFT ET AL 2,503,080

MECHANICAL PENCIL WITH PUSH BUTTON TYPE LEAD FEEDING MEANS

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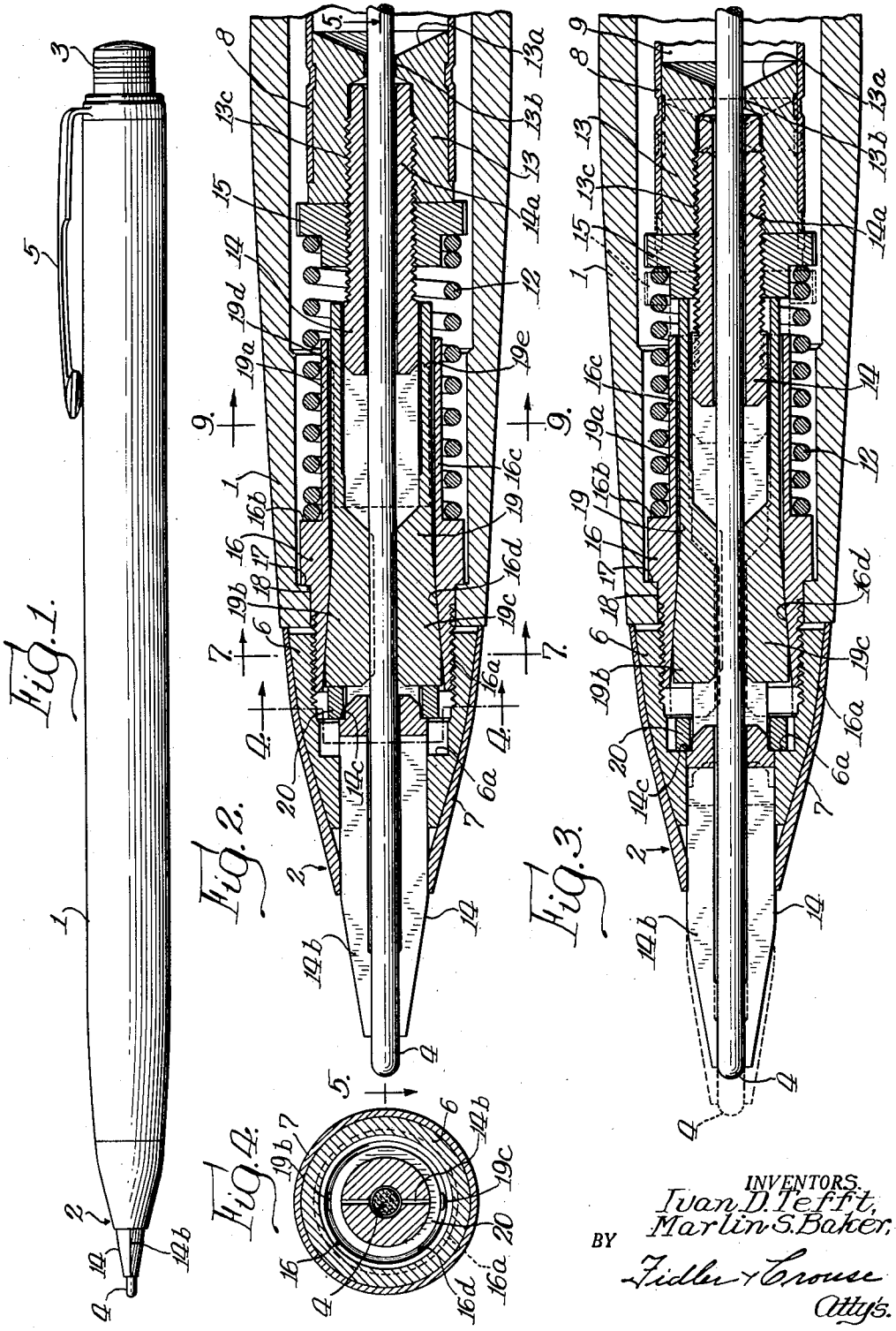


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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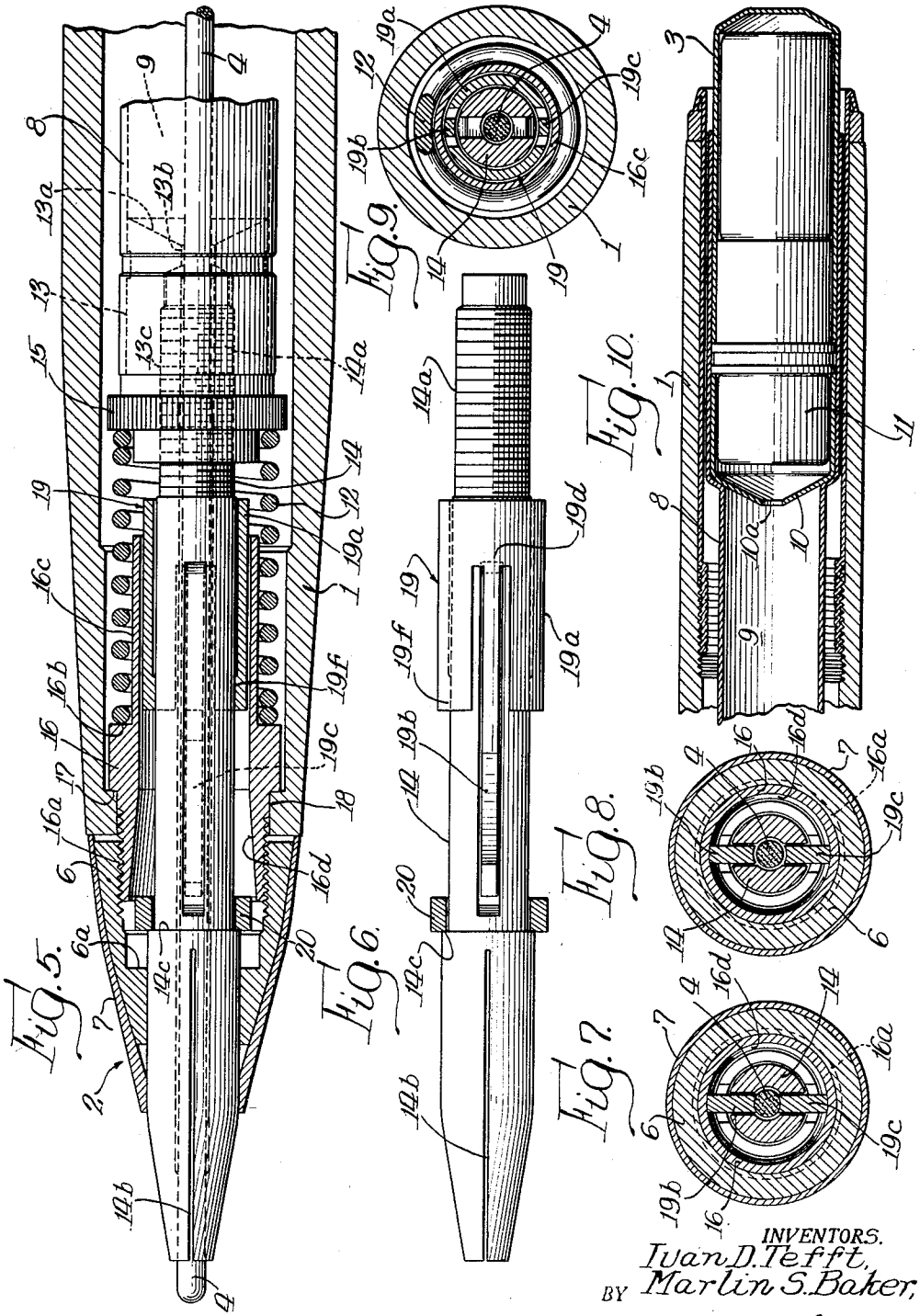


Fig. 5.

Fig. 6.

Fig. 9.

Fig. 10.

Fig. 8.

Fig. 7.

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MECHANICAL PENCIL WITH PUSH-BUTTON TYPE LEAD FEEDING MEANS

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6 Claims. (Cl. 120—17)

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This invention relates to mechanical pencils, and has to do particularly with a mechanical pencil wherein the writing lead is fed step-by-step in response to repeated operations of a push-button or like means.

One of the objects of our invention is to provide an improved step-by-step continuous feed mechanical pencil which is of simplified construction, will perform reliably, and is capable of being manufactured economically.

Another object is to provide a pushbutton operated mechanical pencil which will feed out, consecutively, one stick of lead after another, in step-by-step fashion as required, with a minimum of lead breakage, and which embodies a smaller number of parts and is easier to assemble than prior step-by-step pencils.

A further object is to provide a mechanical pencil of the pushbutton operated step-by-step feed type wherein the various parts do not necessitate such extremely close manufacturing tolerances as would be difficult to maintain, and wherein none of the parts involve the need for inordinately expensive special tools—thus making it possible to produce a thoroughly dependable product without incurring a large capital layout.

Still another object is to provide a step-by-step feed mechanism which is not susceptible of becoming clogged, and thus rendered inoperative, by graphite dust resulting from abrasion of the writing leads.

An important feature of our invention resides in the simplicity of construction and economy of manufacture which is achieved by so arranging the lead guide tube that it lightly grips the lead so that the lead is drawn forward with the tube but can readily move lengthwise relatively to the tube when restrained by the clutch. By so doing the number of required parts is minimized without in any way impairing the performance of the pencil.

Other objects and advantages of our invention will be apparent from the ensuing detailed description.

In the drawings:

Figure 1 is an elevational view of a mechanical pencil according to a preferred embodiment of our invention;

Fig. 2 is a longitudinal sectional view, on an enlarged scale, of the front end of the pencil of Fig. 1, showing the lead-propelling mechanism in normal condition;

Fig. 3 is a sectional view identical with Fig. 2 except that the moving parts of the lead-propelling mechanisms are shown in an intermediate position which they assume during each retractive movement of the pushbutton and prior to completion thereof;

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Fig. 4 is a transverse sectional view taken along line 4—4 of Fig. 2;

Fig. 5 is a longitudinal sectional view taken along line 5—5 of Fig. 2;

Fig. 6 is a sub-assembly, in elevation, comprising a lead guide tube on which is mounted a clutch;

Fig. 7 is a transverse sectional view taken along line 7—7 of Fig. 2, showing the clutch jaws engaging the lead;

Fig. 8 is a transverse section identical with Fig. 7 but showing the clutch jaws released and out of engagement with the writing lead;

Fig. 9 is a transverse sectional view taken along line 9—9 of Fig. 2; and

Fig. 10 is a large scale longitudinal sectional view of the rear end of the pencil, showing details of the pushbutton and adjacent parts.

The pencil illustrated is largely conventional in outward appearance and comprises an elongate hollow barrel 1, having a conically tapered tip 2, and from the rear end of which projects a pushbutton 3. The function of said pushbutton is to cause the writing lead 4 to be fed out step-by-step—the lead being advanced a small amount in response to each depression of the pushbutton. The pencil may be equipped with a spring-type pocket clip 5 of conventional design.

Tip 2 comprises an internally threaded, externally tapered nut 6 encased within a tapered outer shell 7. Parts 6 and 7 may be integral, but it is convenient, for manufacturing reasons, to use two parts, especially when the exposed surface is to be plated. Nut 6 serves to retain in the barrel the entire sub-assembly comprising the lead-propelling mechanism together with the lead storage magazine and pushbutton, which parts constitute, in the aggregate, a self-contained unit which can be inserted into and withdrawn from the rear end of the barrel, being held in place solely by nut 6.

An elongate tube 8 forming a part of the aforementioned sub-assembly is disposed within barrel 1, extending lengthwise thereof, and serves both as a lead storage magazine and as a connecting link between pushbutton 3 and the lead-propelling mechanism, which latter is contained wholly within the forward end of the barrel. The lead storage magazine is identified by reference numeral 9.

Tube 8 is formed with an enlarged diameter at its rear end to receive a sheet metal cup-like closure member 10, together with pushbutton 3 which is also a cup-like member formed of sheet metal. The latter is spring-retained and slip fitted in the enlarged bore of tube 8 and can easily be withdrawn and reversed to expose an eraser 11. Member 10 is provided with a small axial opening 10*a* through which sticks of lead are inserted into lead storage magazine 9.

When pushbutton 3 is depressed, tube 8 moves forwardly with it against the opposition of a coil spring 12.

Fixedly secured in the forward end of tube 8 is a plug 13 which is concaved at 13*a* for the purpose of guiding successive sticks of lead toward the axial bore 13*b*. Plug 13 is internally threaded at 13*c* to engage the externally threaded end 14*a* of a lead guide tube 14, which is shown most clearly in the sub-assembly view Fig. 6. It will be seen that tube 14 is, in effect, a continuation of tube 8.

Mounted on the threaded rear end 14*a* of tube 14 is a nut 15 which serves to lock the connection between tube 14 and plug 13; and said nut is turned down to form a seat and centering boss for the rear end of spring 12.

A sleeve 16 having an external thread 16*a* is held in place by nut 6 against a shoulder 17 formed in barrel 1 and is centered in the barrel by bore 18. A shoulder 16*b* formed on sleeve 16 provides an abutment for the forward end of spring 12, while the reduced portion 16*c* serves as a guide to prevent said spring buckling and thus possibly interfering with the operation of the lead-propelling mechanism. The bore of sleeve 16 is conically tapered at 16*d* to cooperate with the jaws of a clutch 19 which serves normally to lock the writing lead and aids in the step-by-step forward movement thereof.

Tube 14 is bored axially from end to end to form a conduit through which sticks of lead are fed step-by-step from magazine 9, and said tube is split lengthwise at 14*b* to form spring fingers for yieldably gripping the lead. The mid-portion of tube 14 is reduced in diameter to form a shoulder at 14*c* which bears against a ring 20. The diameter of the forward portion of said tube is such as to afford a sliding fit thereof in the bores of parts 6 and 7. Ring 20 is a sliding fit on tube 14.

Clutch 19 is carried by tube 14 and comprises a tubular sleeve portion 19*a* which encircles said tube and is in spring-pressed frictional engagement therewith at 19*f*, so that when not restrained by external interference it will follow the lengthwise movements of said tube 14. In addition to sleeve 19*a*, said clutch comprises a pair of oppositely disposed jaws 19*b* and 19*c*, which preferably are integral with sleeve 19*a* and take the form of long narrow arms resiliently anchored to sleeve 19*a* at points 19*d* and 19*e* respectively. Said arms are spring biased outwardly so that the jaws tend always to separate.

The two jaws 19*b* and 19*c* extend respectively through two diametrically opposite elongate slots milled in tube 14 to effect, jointly, a gripping or clutching engagement with writing lead 4. Normally, the lead is so gripped and thus restrained against retraction. The slots in tube 14 are longer than the clutch jaw portions which extend through them and consequently it is possible for tube 14 to move lengthwise relatively to clutch 19 to a limited extent. The amount of this relative movement, as presently will appear, determines the distance the writing lead is propelled forwardly in response to each full depression of the pushbutton.

The outer surfaces of jaws 19*b* and 19*c* are sloped lengthwise complementally to the conically tapered bore 16*d* of sleeve 16. Thus, when the clutch, including said jaws, is forced backwardly as is normally the case, the jaws are contracted by sleeve 16 into clutching engagement with the lead. This is best illustrated in Fig. 2 from which it will be seen that clutch 19 is held against the conical bore of sleeve 16 by ring 20 which, in turn, is forced backwardly by tube 14, actuated by spring 12, through the medium of nut 15.

When pushbutton 3 is depressed, tube 14 is, as a result, pushed forwardly by tube 8 and plug 13 against the opposition of spring 12; and clutch 19 moves forwardly at the same time by reason of its frictional adherence to tube 14 and by further reason that for a time there is nothing to interfere with such forward movement of the clutch. Jaws 19*b* and 19*c* are released from the conical bore 16*d* of sleeve 16 at the outset of each forward movement and, because of their outwardly directed spring bias, they promptly disengage the writing lead. Shortly thereafter ring 20 engages a shoulder 6*a* on nut 6 (see Fig. 3) and its forward movement is thereupon arrested—which, in turn, arrests the forward movement of clutch 19. Tube 14 thereafter continues its forward movement until nut 15 strikes the back end of clutch 19, as depicted in Fig. 3.

Since the writing lead is at all times lightly gripped by the front end of tube 14, it moves forwardly with said tube after being released from the restraint of the clutch jaws.

When pushbutton 3 is released, following a full depression thereof, tube 14 is immediately retracted by spring 12 and, by reason of the aforementioned frictional adherence, between said tube and clutch 19, carries the latter with it. This results in also retracting the lead a short distance relatively to the barrel 1; but, presently, jaws 19*d* and 19*c* engage the conical bore 16*d* of sleeve 16 (see Fig. 3) and are contracted thereby with sufficient force to engage the lead and hold it against further retraction while tube 14 continues its backward movement. The lead thereupon starts emerging from the front end of tube 14. The backward movement of tube 14 is arrested when it reaches the point where ring 20 is gripped by the shoulder 14*c* and the front ends of jaws 19*b* and 19*c*, as shown in Fig. 2. The force of spring 12 then acting through tube 14 and ring 20 upon jaws 19*b* and 19*c* presses said jaws so firmly against the conical bore of sleeve 16 that they are caused to contract and firmly grip the lead, thus preventing retraction thereof under writing pressure. In fact the writing pressure exerted on the lead serves to increase the grip of the jaws on the lead.

Fig. 3 shows in dotted lines the tube 14 and clutch 19 in their forwardmost positions, and further shows, in full lines, the relative positions of those members at the instant when the clutch jaws have just come into engagement with conical bore 16*d* of sleeve 16, while tube 14, pushbutton 3 and tube 8 are still moving rearwardly.

In addition to being very efficient in operation and quite economical to manufacture, the lead feeding mechanism of the present invention is particularly advantageous in that there are no interengaging moving parts which are susceptible of being clogged by accumulations of

graphite dust; and this is especially significant with respect to the tip end construction which entails no telescoped relatively moving parts, such as are found in certain prior art lead feed mechanisms.

We claim:

1. In a mechanical pencil, a barrel, a lead guide tube extending axially of said barrel and having an axial bore forming a conduit for writing lead, said tube having at its forward portion means for constantly exerting a light gripping action on a lead therein so that it moves lengthwise with said tube except when restrained by external interference, said tube being reciprocable lengthwise of said barrel to a limited extent with said forward portion movable freely through the forward end of said barrel without abutment thereagainst, a spring continuously urging said tube rearwardly in the barrel toward a position which it normally occupies, and a clutch for locking said lead against rearward movement under writing pressure, said clutch being operative in response to each forward movement of said tube and at the outset of each such movement to release the lead so that it is movable forwardly with said tube, said clutch being further operative in response to each rearward movement of said tube and prior to the completion of each such movement to restrain the lead against further rearward movement whereby said lead is caused to emerge from the forward end of said tube.

2. In a mechanical pencil, a barrel, a lead guide tube extending axially of said barrel and having an axial bore forming a conduit for writing lead, said tube having means for continuously exerting uniform gripping action on a lead therein so that it moves lengthwise with said tube except when restrained by external interference, said tube being reciprocable lengthwise of said barrel to a limited extent, a spring continuously urging said tube rearwardly toward a position which it normally occupies, a clutch for locking said lead against rearward movement under writing pressure, said clutch being operative in response to each forward movement of said tube and at the outset of each such movement to release the lead so that it is movable forwardly with said tube, said clutch being further operative in response to each rearward movement of said tube and prior to the completion of each such rearward movement to restrain the lead against further rearward movement, said clutch comprising a sleeve mounted on said tube and frictionally adhering thereto and a plurality of finger-like jaws each connected at one end to said sleeve and extending lengthwise of said tube, there being a plurality of lengthwise slots in said tube in registration with said jaws, respectively, and through which said jaws are movable to engage and disengage the lead in said conduit, said clutch being movable lengthwise along said tube to a limited extent, means operating to arrest the movement of said clutch during each forward movement of said tube, and means operative to contract said jaws into clutching engagement with the lead during each rearward movement of said tube and prior to the completion thereof whereby to arrest the rearward movement of the lead while the tube continues its rearward movement to completion.

3. In a mechanical pencil, a barrel, a lead guide tube extending axially of said barrel and having an axial bore forming a conduit for writing lead, said tube being split lengthwise at its forward end to form a plurality of inwardly pressing

spring fingers for continuously exerting a uniform gripping action on said lead so that it moves lengthwise with said tube except when restrained by external interference, said tube being reciprocable lengthwise of said barrel to a limited extent, and formed with its forward end of less diameter than the end of said barrel whereby the forward end of said tube is reciprocable through the forward end of said barrel without abutment against the end of said barrel a spring continuously urging said tube rearwardly of the barrel toward a position which it normally occupies, a clutch for locking said lead against rearward movement under writing pressure, said clutch being operative in response to each forward movement of said tube and at the outset of each such movement to release the lead so that it is movable forwardly with said tube, said clutch being further operative in response to each rearward movement of said tube and prior to the completion of each such movement to restrain the lead against further rearward movement whereby said lead is caused to emerge from the forward end of said tube.

4. In a mechanical pencil, a barrel, a lead guide tube extending axially of said barrel and having an axial bore forming a conduit for writing lead, the forward end portion of said tube projecting from said barrel and being split lengthwise to form spring fingers which continuously grip the lead sufficiently to hold it against gravity without locking the same against movement lengthwise of said tube, the gripping of the lead by said fingers being also sufficient to cause the lead to move lengthwise with said tube when the lead is not restrained by the hereinafter-mentioned clutch, said tube being reciprocable lengthwise to a limited extent relatively to said barrel, a lead storage magazine connected with the rear end of said tube and reciprocable therewith, a clutch comprising a sleeve concentric with and encircling said tube and in frictional adherence thereto so that said clutch moves with said tube except when restrained by external interference, said clutch including a plurality of elongate jaws extending forwardly from said sleeve lengthwise of said tube and each connected at one end to said sleeve, said jaws being spring-biased outwardly from the axis of said tube, there being a plurality of elongate slots in said tube through which said jaws extend individually for conjointly gripping said lead, a stationary sleeve disposed in said barrel and encircling said clutch, said sleeve being operative to force said jaws into gripping engagement with the lead when said clutch is moved rearwardly and to release said jaws when said clutch is moved forwardly, a ring mounted on said tube in front of said jaws and slidable along said tube, said tube having a shoulder forming an abutment for said ring at the side thereof opposite said jaws, said tube being movable forwardly to a limited extent relatively to said ring and said clutch, and a spring for retracting said tube, said clutch being operative to arrest the rearward movement of said lead during a portion of each retractive movement of said tube, said tube being operative upon retraction to apply spring pressure through said ring to said clutch whereby to lock the lead against lengthwise movement.

5. A mechanical pencil comprising a barrel open at its forward end, a lead guide tube reciprocable in said barrel and having its forward end portion extending through and of less diameter than the opening in the forward end of said

barrel whereby it is freely movable through said forward opening without abutment with the end of said barrel, said tube having means at its forward end portion for exerting a constant grip on a lead therein sufficient to cause the lead to move with the tube except when the lead is otherwise held against movement, a clutch in said barrel, actuating means for said clutch effective upon a predetermined rearward movement of said tube to cause said clutch to grip a lead in said tube sufficiently to hold the lead against rearward movement with said tube and against writing pressure, said clutch being released upon predetermined forward movement of said tube, spring means urging said tube rearwardly in said barrel, and manually operable means projecting from said barrel for moving said tube forwardly in said barrel.

6. A mechanical pencil comprising a barrel open at its forward end and having a cylindrical bore portion adjacent its forward open end, a lead guide tube reciprocable in said barrel and having its forward end portion slidably guided in said cylindrical bore portion, and of less diameter than said forward open end whereby said tube is freely movable through said forward opening without abutment with the end of said barrel, said tube having means at its forward

end portion for exerting a constant grip on a lead therein sufficient to cause the lead to move with the tube except when the lead is otherwise held against movement, a clutch in said barrel, actuating means for said clutch effective upon a predetermined rearward movement of said tube to cause said clutch to grip a lead in said tube sufficiently to hold the lead against rearward movement with said tube and against writing pressure, said clutch being released upon predetermined forward movement of said tube, spring means urging said tube rearwardly in said barrel, and manually operable means projecting from said barrel for moving said tube forwardly in said barrel.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,592,502	Pollak	July 13, 1926
1,742,711	Maloney	Jan. 7, 1930
1,759,931	Barberon	May 27, 1930
2,358,091	Lovejoy	Sept. 12, 1944