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MECHANICAL PENCIL

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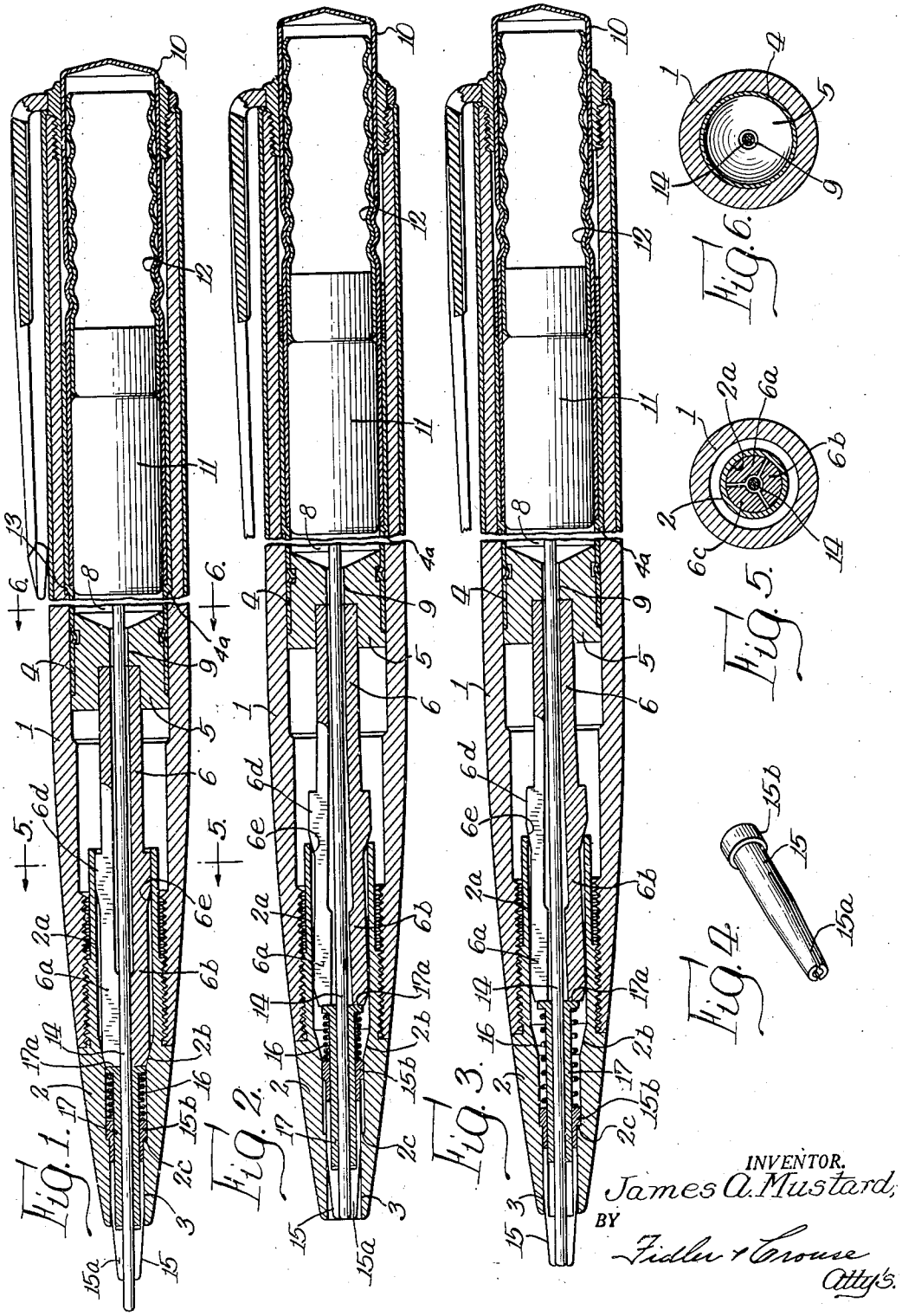

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

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MECHANICAL PENCIL

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13 Claims. (Cl. 120—17)

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My invention relates to mechanical pencils and it has to do particularly with so-called continuous feed pencils wherein a reservoir is loaded with a plurality of leads which are fed therefrom in succession by manually operable feed mechanism.

Pencils of the foregoing type, as heretofore employed, have been of complicated construction requiring a large number of parts involving a rather high manufacturing cost. They have, therefore, necessarily been expensive to make, involving high cost to the user with considerable repair expense. They also get out of order easily, requiring frequent repairs. Further, much difficulty has been experienced with such pencils because of lead breakage, particularly when thin leads are employed. One of the objects of my invention is to provide an improved pencil of the foregoing character and by which all of the foregoing objections have been overcome.

Another object is to provide a continuous feed pencil which is of very simple construction wherein but few parts are employed, which parts are of sturdy and durable form and may be manufactured at low cost so that pencils embodying my invention may be sold at a relatively low price.

A further object is to provide a pencil of the foregoing character which although quite simple in construction, is adapted to give greatly increased writing efficiency with increased economy in the use of lead (thin or otherwise) through elimination of lead breakage.

An additional object is to provide a new and novel feed mechanism through which all of the foregoing features and advantages are attained.

A further object is to provide a fool-proof continuous feed mechanism which is subject to a minimum of wear and which receives a positive and uniform feed action for an indefinitely long period of time.

A more specific object is to provide a feed mechanism which is actuated from opposite ends of the pencil, in that part of the actuation is effected by pushing in the point of the pencil and the remainder by restoring a push button at the rear end of the pencil, which push button is positioned by the aforesaid front end actuation whereupon it may be actuated to effect operation of the feed mechanism to propel the lead into writing position. This arrangement provides an improved and facile feed manipulation which greatly reduces the period of interruption in the use of the pencil to effect lead feed.

Other objects and advantages of my invention

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will be apparent from the detailed description which follows, taken in conjunction with the accompanying drawing, wherein:

Figure 1 is a longitudinal sectional view of an entire pencil according to a preferred embodiment of the invention and depicting the normal condition of the pencil mechanism;

Fig. 2 is a longitudinal sectional view of the pencil, depicting the lead propulsion mechanism in the released condition;

Fig. 3 is a sectional view similar to Fig. 2 and depicting an intermediate step in the operation of the lead propulsion mechanism;

Fig. 4 is a perspective view of a split sleeve forming the tip end of the lead propulsion mechanism;

Fig. 5 is a transverse sectional view taken along line 5—5 of Fig. 1; and

Fig. 6 is a transverse sectional view taken along line 6—6 of Fig. 1.

The pencil structure illustrated comprises an elongate hollow barrel 1 to the front end of which is detachably connected a conically tapered tip member 2 having a bore 3 co-axial with that of the barrel.

Disposed within and reciprocable lengthwise of the barrel 1 is an assemblage which includes an elongate tubular member 4 closed at its forward end by means of a plug 5 to which is connected a forwardly extending clutch member 6.

Tubular member 4 has a compartment 8 forming a magazine in which may be stored a considerable number of writing leads which are adapted to be fed out, one at a time, through the axial bore 9 of plug 5.

A cup-like pushbutton member 10 is slidably telescoped into the back end of tube 4 and is withdrawable therefrom.

An eraser 11 is secured to member 10 by means of a threaded sheet metal sleeve 12. The subassembly comprising elements 10, 11 and 12 is a self-contained unit which upon withdrawal from tube 4, can be reversed so that eraser 11 projects from the back end of the pencil. An annular shoulder 13 formed in the bore of the barrel provides a stop against which a shoulder 4a on the tube 4 abuts for limiting the forward movement of tube 4 which is shown in its forwardmost or writing position in Fig. 1.

Clutch member 6 is an elongate tube of suitable spring material having an axial bore large enough to freely receive the writing lead 14 and is split lengthwise throughout a portion of its length, as shown in Fig. 5, to form three jaws 6a, 6b and 6c, which are disposed symmetrically

about the bore portion 2*a* of the tip member 2 and the writing lead 14. Member 6 has an annular enlargement 6*d*, the forward portion of which is conically tapered as indicated at 6*e*.

Normally, in writing position, clutch member 6 is so positioned that the annular enlargement 6*d* is within the bore 2*a* of tip member 2, which bore is of a diameter such as to cause the aforementioned jaws normally to be moved inwardly or contracted to grip the writing lead. Thus the lead normally is held against retraction under ordinary writing pressure.

A portion of the bore of tip member 2 is conically tapered at 2*b* for engagement with a complementally shaped front end portion of the jaws 6*a*, 6*b* and 6*c* in the normal or writing position of the clutch member to assist in holding the clutch jaws in uniform gripping engagement with the writing lead.

Disposed within the bore of tip member 2 and at the front end of barrel 1 is a sleeve 15, which is shown in perspective in Fig. 4. This sleeve is split lengthwise throughout a portion of its length, as indicated at 15*a*, to afford a resilient lead gripping action, the bore thereof, at the forward end, being of such diameter that it always lightly grips the writing lead and thus the sleeve server as a lead clutch. This gripping action is sufficient to insure that the writing lead will move forwardly with sleeve 15, as hereinafter described, when the lead is not restrained by clutch member 6.

Sleeve 15 has a head 15*b* which normally engages a shoulder 2*c* formed in tip member 2, and this provides a stop for limiting the forward movement of sleeve 15. Said sleeve is freely reciprocable lengthwise of the barrel, but normally is yieldably held in its forward position, Fig. 1, by means of a coil spring 16.

Situated at the rear of sleeve 15 and telescoped therewith is a second sleeve 17 having an axial bore concentric with that of sleeve 15 and proportioned to slidably fit the writing lead. Sleeve 17 has a rear external flange 17*a* which provides an abutment for the rear end of spring 16. This sleeve is reciprocable lengthwise, being abutted by the forward end of clutch member 6.

In Fig. 1 the several parts are shown in the positions which they occupy when the pencil is in readiness for writing—the writing lead 14 being shown projecting from the forward end of sleeve 15.

Forward propulsion of the writing lead is accomplished by placing the projecting tip end of the pencil (the projecting part of sleeve 15) against any convenient and suitable solid object and pressing the pencil thereagainst. This immediately causes a rearward movement of sleeve 15 into the barrel, as depicted in Fig. 2.

The rearward movement of sleeve 15 is directly transmitted to sleeve 17 which, in turn, effects an equal rearward movement of clutch member 6, plug 5, tube 4 and pushbutton 10, together with eraser 11 and sleeve 12. This is clearly illustrated in Fig. 2.

The rearward movement just described effects a rearward withdrawal of enlargement 6*d* from the bore 2*a*, whereupon the jaws 6*a*, 6*b* and 6*c* move or spring radially out of gripping engagement with the writing lead. The lead is thereby freed from clutch 6 and is thus capable of being moved lengthwise relatively to the clutch jaws.

Following the above-described operation, the pencil may immediately be withdrawn from the aforementioned solid object and, thereupon,

sleeve 15 is moved forwardly by spring 16, carrying with it the writing lead 14 while the other parts remain in the positions in which they are shown in Fig. 2. This is fully illustrated in Fig. 3, which, it will be seen, differs from Fig. 2 only in that sleeve 15 has been returned to its normal position with the spring 16 expanded.

If now, push button 10 is depressed, clutch member 6 will be moved forwardly from the position in which it is shown in Figs. 2 and 3, whereupon the conically tapered forward portion 6*e* of enlargement 6*d* will be engaged by the adjacent back end of tip member 2; and, as the clutch member continues to move forwardly, the jaws thereof will be deflected inwardly into gripping engagement with the writing lead. The clutch member 6 is so proportioned that the lead is gripped thereby just before enlargement 6*d* fully enters bore 2*a*, suitable allowance being made so that the grip of the jaws on the lead is sufficient to hold it firmly, while at the same time the pressure required to force enlargement 6*d* into bore 2*a* is not excessive. This pressure should at least be enough to overcome the writing pressure, which otherwise would cause unwanted retraction of the clutch member and other parts.

The clutch 6 grips the lead shortly after the commencement of its forward movement and at a point in its forward travel so chosen that the remainder of said forward travel is equal dimensionally to the distance which it has previously been determined the lead should project from the front end of sleeve 15, as depicted in Fig. 1. As soon as the clutch jaws take hold of the lead, the latter moves forward with the clutch member; but since sleeve 15 is already in its forwardmost position, the lead moves forward relatively thereto, notwithstanding the continuous grip of said sleeve on the lead.

It will be noted that sleeve 17 always remains in abutting relation with the forward end of the clutch 6 with its bore concentric with those of the clutch 6 and sleeve 15. In this way it connects the clutch bore directly with the bore of sleeve 15 and gives a long and substantial support to the lead all the way from the clutch to the sleeve 15, thereby preventing lead breakage. It also ensures a substantially continuous feed passage through the pencil by way of the clutch and sleeves 17 and 15 from the lead magazine so that the leads may be fed one after the other until all of the leads in the magazine are used up. The sleeve further ensures this action in that it serves as a positive guide for an oncoming new lead from the clutch 6 in order that such new lead may properly propel a short unused lead section that is being supported forwardly in the bore of sleeve 15. With the foregoing arrangement, positive lead alinement is ensured and long and very thin leads may be employed without breakage within the operating mechanism.

It will be observed that the component parts of my new pencil are relatively few in number, and all said parts are of such design that they inherently are easy to produce in volume and further such that the necessary precision can readily be maintained. What is more, it will be evident that all assembling operations are simple and can be performed rapidly by unskilled workers. Thus, I have provided a very inexpensive pushbutton-operated pencil which is so simple and rugged that it is likely to remain in good working order a very long time. In the use of my invention, thin leads may be employed without danger of breakage by operation of the lead-feed-

ing means. This is a distinct advantage, adding to the efficiency and long life of the pencil.

I have shown and described what I consider to be a preferred embodiment of my invention, but it will be obvious that there are a great variety of possible modifications within the purview thereof and, accordingly, I do not wish to be limited except as clearly indicated by the terms of the appended claims.

I claim:

1. The combination in a mechanical pencil, of a barrel, and lead propelling means normally projecting from the front end of said barrel and reciprocable lengthwise of the barrel to a limited extent, said propelling means including a clutch which normally grips the writing lead and holds it against rearward movement under normal writing pressure, said clutch being releasable in response to a rearwardly directed releasing pressure applied to the front end of said propelling means that is greater than the normal writing pressure, and means included in said propelling means for moving the lead forwardly to a predetermined limited extent when said releasing pressure is discontinued and while said clutch continues released, said clutch being manually operable, after being released, to re-engage the writing lead and move it forwardly an additional predetermined amount.

2. The combination in a mechanical pencil, of a barrel, and lead propelling means normally projecting from the front end of said barrel and reciprocable lengthwise of the barrel to a limited extent, said propelling means including a clutch which normally grips the writing lead and holds it against rearward movement under normal writing pressure, said clutch being releasable in response to a rearwardly directed releasing pressure applied to the front end of said propelling means that is greater than the normal writing pressure, a push button operatively associated with said propelling means, and means included in said propelling means and operative upon discontinuance of said releasing pressure for moving the lead forwardly to a predetermined extent independently of said pushbutton, said pushbutton being operative to propel the lead forwardly an additional predetermined amount and concurrently operative to actuate said clutch.

3. The combination in a mechanical pencil, of lead propelling mechanism normally projecting from the front end of said barrel, a push button operatively associated with said propelling mechanism and projecting from the rear end of said barrel, said mechanism including a clutch member disposed within said barrel and reciprocable lengthwise thereof, said clutch member having a forward position in which it grippingly engages the writing lead and holds it against rearward movement under normal writing pressure and a rearward position in which it is disengaged from the writing lead, said clutch member being movable to its rearward position by the application of a rearwardly directed pressure on the front end of the pencil and movable to its forward position by depressing said push button, said propelling mechanism including means other than said clutch member for propelling the lead forwardly a predetermined amount upon discontinuance of said rearwardly directed pressure and while said clutch member remains in its rearward position, said clutch member being further operative during its forward movement to propel the writing lead forwardly an additional predetermined amount.

4. The combination in a mechanical pencil, of lead propelling mechanism including a split sleeve disposed at the front end of the barrel and normally projecting outwardly therefrom, said sleeve being reciprocable lengthwise and having an axial bore adapted to accommodate a writing lead and to grip the same lightly, a spring continuously urging said sleeve forwardly, a clutch member disposed within said barrel and reciprocable lengthwise thereof between a predetermined forward position and a predetermined rearward position, and a push button projecting from the rear end of said barrel and connected with said clutch member, said clutch member being movable rearwardly by the application of an actuating pressure on the front end of said sleeve and movable forwardly by depressing said push button, said clutch member being operative in response to a forward movement thereof to grip the writing lead and move it forwardly and to retain its grip on the writing lead while it remains in its forward position, but ineffective to grip said lead when in said rearward position.

5. The combination in a mechanical pencil, of a barrel having a lengthwise extending bore opening at its front end, a sleeve mounted in the front end of said bore and reciprocable lengthwise thereof to a limited extent, said sleeve having a lengthwise bore adapted to accommodate a writing lead and to yieldably grip said writing lead, said sleeve normally projecting a substantial distance out of the front end of said barrel and forceably movable rearwardly a substantial distance from its normal position, a clutch member disposed within said barrel at the rear of said sleeve and reciprocable lengthwise of said barrel to a limited extent, said clutch member being movable rearwardly of the barrel in response to a rearward movement of said sleeve, and manually operable means for moving said clutch member forwardly, said clutch member being operative in response to forward movement thereof to grip the writing lead and advance the same forwardly, said clutch member being operative in response to rearward movement thereof to release the writing lead, said sleeve being free to return to its normal position independently of said clutch member and operative when so doing to carry the writing lead forwardly provided said clutch member is retained in its released condition during said forward movement of the sleeve.

6. The combination in a mechanical pencil, of a barrel having a lengthwise extending bore opening at its front end, a sleeve mounted in the front end of said bore and reciprocable lengthwise thereof to a limited extent, a spring continuously urging said sleeve forwardly, said sleeve having a lengthwise axial bore adapted to accommodate a writing lead and further adapted continuously to yieldably grip said writing lead, said sleeve normally projecting a substantial distance out of the front end of said barrel, a clutch disposed within said barrel at the rear of said sleeve and reciprocable lengthwise of said barrel to a limited extent, said clutch normally occupying a forward position wherein it grippingly engages the writing lead and holds the same against retraction due to ordinary writing pressure, means effective to release the grip of said clutch on said writing lead in response to a rearward movement of said clutch, said clutch being movable rearwardly in response to a rearward movement of said sleeve and to an extent sufficient to release its grip on

the writing lead, means effective in response to a subsequent forward movement of said clutch to cause said clutch to grip the writing lead and move it forwardly, said sleeve being movable by said spring, independently of said clutch, to its normal forward position and operative during each such forward movement to propel the writing lead forwardly, provided said clutch is retained in its released condition during such forward movement of the sleeve.

7. The combination in a mechanical pencil, of a barrel having a lengthwise extending bore opening at its front end, a sleeve mounted in the front end of said bore and reciprocable lengthwise thereof to a limited extent, a spring continuously urging said sleeve forwardly, said sleeve having a lengthwise axial bore adapted to accommodate a writing lead and further adapted continuously to yieldably grip said writing lead, said sleeve normally projecting a substantial distance out of the front end of said baarrel, a clutch disposed within said baarrel at the rear of said sleeve and comprising a plurality of jaws which are conjointly operative and normally effective to grip said writing lead and hold the same against retraction under normal writing pressure, said clutch being reciprocable lengthwise of said barrel to a limited extent and normally occupying a position at the forward end of its travel, means operative to contract said jaws into gripping engagement with the lead and to hold said jaws so contracted except when said clutch occupies a rearward position, said means being effective to contract said jaws at or near the outset of each forward movement of the clutch from its rearward position, said clutch being movable rearwardly, in response to a rearward movement of said sleeve, to a position wherein the jaws are released, and manually operable means for moving said clutch forwardly, said sleeve being movable forwardly by said spring to its rearward position independently of said clutch.

8. The combination in a mechanical pencil, of a barrel having a lengthwise extending bore opening at its front end, a first sleeve mounted in the front end of said bore and reciprocable lengthwise thereof to a limited extent, said first sleeve having a lengthwise axial bore adapted to accommodate a writing lead and further adapted continuously to yieldably grip said writing lead, said first sleeve normally projecting a substantial distance out of the front end of said barrel, a second sleeve disposed within said barrel at the rear of said first sleeve and having an axial bore coaxial with that of said first sleeve and of a diameter to slidably fit said writing lead, said second sleeve being reciprocable lengthwise to a limited extent independently of said first sleeve and movable rearwardly in response to rearward movement of said first sleeve, a spring interposed between said first and second sleeves and continuously urging said first sleeve forwardly and said second sleeve rearwardly, a clutch member disposed within said barrel to the rear of said second sleeve and reciprocable lengthwise of said barrel to a limited extent, said clutch member being engaged at its front end by said second sleeve and movable rearwardly thereby, said clutch member having an axial bore coaxial with the bore of said sleeves for accommodating the writing lead and having jaw means for grippingly engaging the lead for holding the same against rearward movement under normal writing pressure, means operative to actuate said jaw means into gripping engagement with the lead and effective so to do in response to and during each full forward movement of the clutch member from its rearmost position, said means being further operative to hold said jaw means actuated while said clutch member remains in its forwardmost position, and push button means for propelling said clutch member forwardly, the arrangement being such, firstly, that the writing lead is released from the grip of said jaw means in response to a rearwardly directed releasing pressure applied to said first sleeve, secondly, that said first sleeve is restored to its normal forward position when said releasing pressure is released, carrying the lead forwardly with it and, thirdly, that the writing lead is gripped and moved forwardly in response to a forward movement of the clutch member from its rearward position, thus propelling the writing lead out of the front end of said first sleeve.

9. In a mechanical pencil having a barrel, lead propelling mechanism comprising a member reciprocably mounted in the writing end of said barrel to support and lightly frictionally grip the writing end of a lead and normally projecting from the writing end of said barrel, clutch means reciprocable in said barrel, means to hold said clutch normally in firm clutching engagement with said lead within said barrel and hold said clutch and lead against movement inwardly of the barrel away from the writing end under normal writing pressure but releasing said clutch upon application of a pressure greater than normal writing pressure against the writing end of said lead or said reciprocably mounted member to permit said clutch, reciprocably mounted member and lead to be moved by such greater pressure, means to project said reciprocably mounted member and advance said lead upon release of pressure from the outer end of said member, and means connected with said clutch and projecting from the rear end of said barrel and manually movable inwardly in said barrel to return said clutch forwardly into cooperation with said holding means to cause said clutch to re-grip said lead and further advance said clutch a limited distance to propel said lead a measured distance.

10. In a mechanical pencil having a barrel, lead propelling mechanism comprising a member reciprocably mounted in the writing end of said barrel to support and lightly frictionally grip the writing end of a lead and normally projecting from the writing end of said barrel, clutch means reciprocable in said barrel, means closely surrounding said lead between said reciprocably mounted member and said clutch and engageable by both to transmit pressure from said member to said clutch, means to hold said clutch normally in firm clutching engagement with said lead within said barrel and hold said clutch and lead against movement inwardly of the barrel away from the writing end under normal writing pressure but releasing said clutch upon application of a pressure greater than normal writing pressure against the writing end of said lead or said reciprocably mounted member to permit said clutch, reciprocably mounted member and lead to be moved by such greater pressure, means to project said reciprocably mounted member and advance said lead upon release of pressure from the outer end of said member, and means connected with said clutch and projecting from the rear end of said barrel and manually movable inwardly in said barrel to return said clutch forwardly into cooperation with said holding means to cause said clutch to re-grip said lead and fur-

ther advance said clutch a limited distance to propel said lead a measured distance.

11. A mechanical pencil comprising a barrel, a first lead clutch reciprocable longitudinally in said barrel and including normally open jaws, clutch closing means positioned to engage said clutch, when the latter is moved forwardly a predetermined distance, to close said jaws upon a lead therein and retain them closed during the remainder of the forward movement and effective to retain said clutch in a forward position against normal writing pressure but not against a rearwardly directed releasing pressure in excess of normal writing pressure, a second lead clutch reciprocable longitudinally in said barrel with a portion adapted to project thereform, whereby said second clutch may be moved rearwardly into said barrel by application of an external releasing pressure thereon, said second clutch being effective to constantly exert a sufficient grip on a lead therein to cause the lead to move therewith when said first clutch is in open condition, a driving element abutting said first clutch and slidable relatively to said second clutch and of such length as to have abutting driving relation with said second clutch when both said clutches are in either their forward or rearward positions, whereby rearward movement of said second clutch when said first clutch is forwardly of its rearward position is effective to move said first clutch rearwardly to thereby release the lead, a spring between and resiliently urging said second clutch and said driving element apart, thereby resiliently maintaining the former in projecting position except when moved rearwardly by the external releasing pressure, and a manually operable element for moving said first clutch forwardly to advance the lead through said second clutch.

12. A mechanical pencil comprising a barrel open at both ends, a lead magazine reciprocable in said barrel, a first lead clutch reciprocable in said barrel forwardly of said magazine and having a plurality of normally open resilient, lead-gripping jaws, a second lead clutch reciprocable

in said barrel forwardly of said first lead clutch, and a tip member having a forward, tapered body section and a rearward sleeve section integral with and of less diameter than the adjacent rearward end of said body section thereby defining a rearwardly facing shoulder, said sleeve section being threaded into the forward end of said barrel with said shoulder abutting the forward end of said barrel to position said tip, said tip member being formed with a bore having a rearward enlarged portion for receiving and closing the jaws of said first clutch against a lead therein upon movement of said first clutch to a predetermined position within said tip and a forward reduced portion receiving said second clutch for guiding the latter.

13. A mechanical pencil comprising a barrel open at its front and rear ends, a tip member having a forward, tapered body section and a rearward sleeve section integral with and of less diameter than the adjacent end of said body section thereby providing a rearwardly facing shoulder, said tip member being threaded into the forward end of said barrel with said shoulder abutting the forward end of said barrel, and having a bore formed with a reduced forward portion in said body section for receiving and guiding a forward lead clutch and an enlarged rearward portion in said sleeve section for receiving and actuating a rearward lead clutch, a lead feeding mechanism including a lead magazine reciprocable in said barrel and projecting from the rear end thereof, a forward lead clutch reciprocable in the forward bore portion of said tip and projecting forwardly therefrom, and a rearward lead-holding clutch having normally open jaws and reciprocable in said rearward bore portion between a lead-gripping position in which said jaws are closed on a lead by the wall, said bore and a lead-releasing position in which said jaws are disengaged from the lead.

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No references cited.