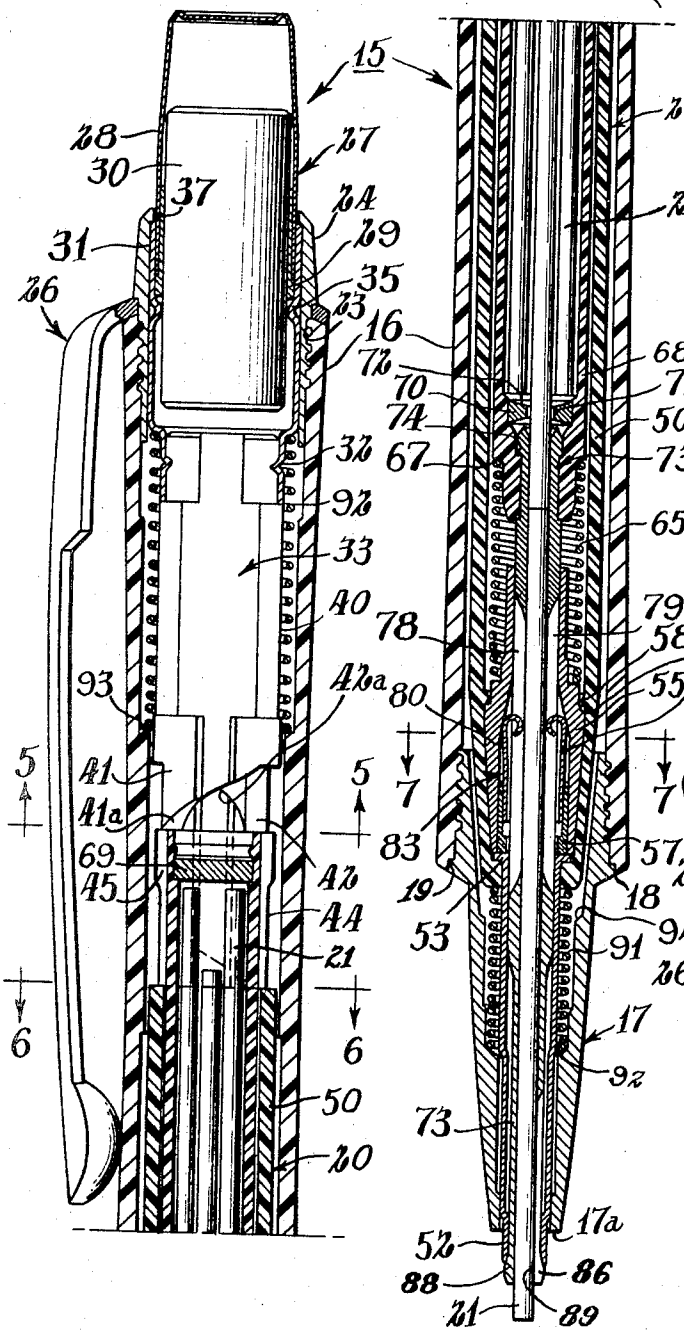
April 8, 1969 D. PARKER 3,437,413

CARTRIDGE REPEATER PENCIL

Filed Aug. 18, 1966 Sheet 1 of 2

FIG. 1.



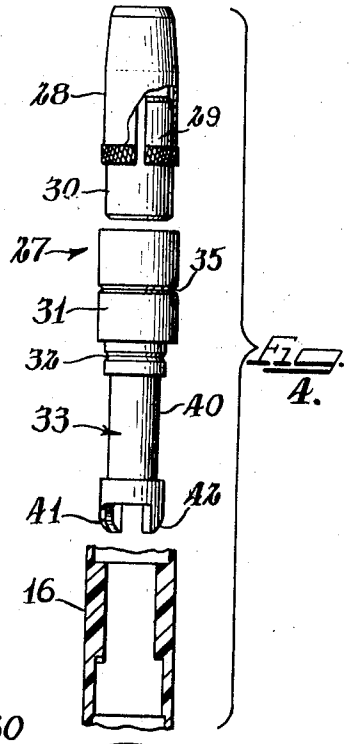


FIG. 4.

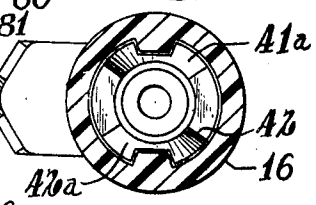


FIG. 5.

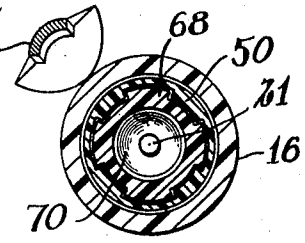


FIG. 6.

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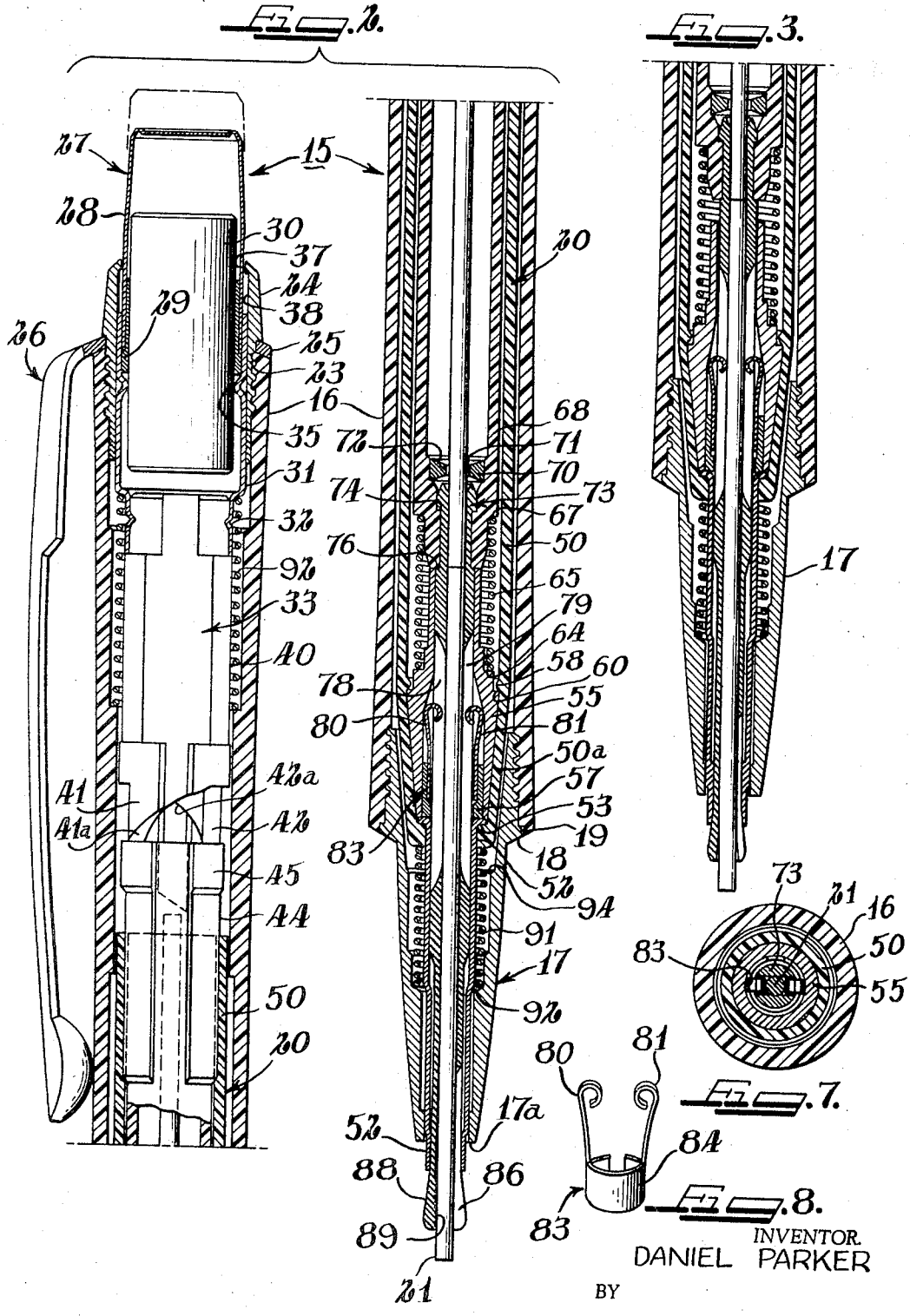

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CARTRIDGE REPEATER PENCIL

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U.S. Cl. 401—67 9 Claims

ABSTRACT OF THE DISCLOSURE

A writing instrument includes a throw-away pencil cartridge comprising a tubular barrel having an actuator assembly slidably mounted in its rearward portion and a self-contained pencil cartridge removably mounted in its forward portion. The self-contained cartridge includes a tubular shell for supporting a lead supply chamber and a lead advancing mechanism in operating engagement with the actuator assembly.

The present invention generally relates to mechanical pencils, and it relates more particularly to a mechanical pencil which includes a removable throw-away type of pencil cartridge incorporating a lead supply and feed mechanism.

Mechanical pencils of the step-by-step type have been known in the prior art for many years and although the cost of manufacturing the step-by-step lead advancing mechanism is substantially greater than the cost of manufacturing the screw feed type lead advancing mechanism, for many applications the ease and reliability of use far outweigh the added expense so that where quality is a prime consideration the step-by-step actuating mechanism is preferable.

Fountain pens, mechanical pencils, and some ball point pens, because of the high quality of design and the precision of manufacture, are treated in the nature of jewelry and under such circumstances the high quality of the craftsmanship and the materials which go into the making of the casing are extremely expensive. Since the average user of writing instruments has need for a fountain pen, a ball point pen, and a pencil from time to time, it would be desirable to provide a single housing in which all three of these different types of writing instruments are adapted to be replaceably mounted. Such a casing could thus accommodate a ball point pen cartridge, a mechanical pencil cartridge, and a fountain pen cartridge. The present invention is concerned with such a casing and with a replaceable type mechanical pencil cartridge which is adapted to be operatively mounted within such casing.

Another reason for designing a mechanical pencil cartridge which is compatible with a housing which also accommodates a ball point pen cartridge and/or a fountain pen cartridge is to reduce substantially the cost of manufacturing both instruments. The separate dies, molds, and other equipment required to manufacture the housings need not be duplicated since the same housing is usable for the several types of writing instruments. Moreover, the dealer is not required to stock as many items on his shelf since the same housing can be filled with any one of the different types of cartridges at the time of purchase, thus appreciably reducing the dealer's required inventory.

Replaceable ball pen cartridges and, more recently, replaceable fountain pen cartridges have been enthusiastically received by the public because of the ease of use and reliability of operation. To date, there has not been a similar mechanical pencil type of writing instrument available on the market. It would, however, be desirable to provide such an instrument. Moreover, because of the mechanical nature of the feed mechanism of this type

pencil, it would be desirable to replace the entire feed mechanism whenever a new supply of lead is placed in the instrument. The feed mechanism can be designed to operate efficiently for a full, predetermined supply of lead thereby permitting a sufficiently low manufacturing cost to permit the marketing of the throw-away type of cartridge at a reasonable price.

It is, therefore, a principal object of the present invention to provide a new and improved writing instrument.

Another object of the present invention is to provide a writing instrument in which the writing mechanism can be readily replaced with an entirely different type of mechanism.

Still another object of the present invention is to provide a new and improved type of mechanical pencil.

Another object of the present invention is to provide a new and improved mechanical pencil employing a step-by-step lead feeding mechanism.

A further object of the present invention is to provide a mechanical pencil incorporating a throw-away cartridge assembly.

A still further object of the invention is to provide a mechanical pencil having a replaceable, throw-away type of step-by-step lead feeding cartridge assembly.

Briefly, the above and further objects are realized in accordance with the present invention by providing a throw-away pencil cartridge which includes, as an integral part thereof, a step-by-step lead feed mechanism and a lead storage chamber permanently connected thereto. The cartridge includes an axially movable actuator member which fits into the actuating mechanism of a writing instrument shell which is also adapted to accommodate either a ball pen cartridge or a fountain pen cartridge.

Further objects and advantages and a better understanding of the present invention may be had by reference to the following detailed description of the invention taken in connection with the accompanying drawings, wherein:

FIGURE 1 is a longitudinally sectioned view of a writing instrument embodying the present invention and showing the instrument in a normal writing condition with a portion of the writing lead extending forwardly of the instrument;

FIGURE 2 is a longitudinally sectioned view of the same instrument shown in FIGURE 1 but with the lead advancing mechanism in a non-writing fully depressed condition;

FIGURE 3 is a fragmentary, longitudinally sectioned view of the forward end of the instrument of FIGS. 1 and 2 showing the lead advancing mechanism in a non-writing condition intermediate the return movement of that mechanism from a full depressed condition to a normal writing condition;

FIGURE 4 is a fragmentary, exploded view, partly in section and somewhat reduced in scale, showing the rearwardly disposed operating portions of the instrument shown in FIG. 1 and viewed perpendicularly to the section plane of FIG. 1;

FIGURE 5 is a sectional view looking rearwardly and taken along the line 5—5 of FIG. 1, assuming the entire mechanism to be shown therein;

FIGURE 6 is a cross-sectional view taken along the line 6—6 of FIG. 1 and rotated through forty-five degrees, assuming the entire mechanism to be shown in FIG. 1;

FIGURE 7 is a cross-sectional view taken along the line 7—7 of FIG. 1 assuming the entire mechanism to be shown therein; and

FIGURE 8 is a perspective view of the clutch member shown in FIGS. 1, 2 and 3.

Referring now to the drawings, and more particularly

to FIGS. 1 and 2 thereof, there is shown a mechanical pencil **15** which includes a barrel **16** formed of any suitable material such, for example, as a plastic. The barrel **16** is a generally cylindrical tubular member having an internally threaded forward end portion for receiving a tubular barrel point member **17**. The point member **17** is preferably formed of metal and includes a relatively narrow annular flange **18** which fits in a complementary counterbore **19** at the forward end of the barrel **16**. The barrel point **17** has a generally tapered external configuration to facilitate holding of the pencil in the fingers during writing.

As shown, a replaceable, throw-away type of lead cartridge and feed unit **20** is carried in the barrel parts **16** and **17** with the forward portion of the unit **20** extending through and beyond the front end **17***a* of the barrel point member **17**. A supply of cyindrical writing lead rods **21** are held by the cartridge **20** and one of the lead rods is carried by the central portion of the cartridge and is adapted to protrude beyond the nose of the cartridge thereby to provide a writing nib. As the present description proceeds, it will be apparent that another lead rod follows the foremost rod through the feed mechanism so that as each rod **21** becomes exhausted, another rod is already in position for use.

The rear or upper end of the barrel **16** is provided with an internal thread **23** which mates with a complementary external thread on a tubular trim member or sleeve **24**. The trim member **24** and the upper end of the barrel **16** cooperate to provide an annular groove in which an integral, ring-shaped portion **25** of a pocket clip **26** is fixedly supported when the trim member **24** is tightly threaded into the barrel **16**.

An actuator assembly **27** is slidably fitted in the trim member **24** as shown. The assembly **27** includes a cup-shaped button member **28**, preferably formed of metal, in which a split ferrule **29** is tightly supported. A cylindrical, resilient eraser **30**, formed of rubber or other material, is press-fitted into the ferrule **29** with a part of the eraser extending forwardly therefrom. The entire assembly **27** may be pulled out of the rear end of the pencil in order to use the eraser **30**. When in the pencil, however, depression of the assembly **27** actuates the lead advancing mechanism as more fully described hereinafter.

In order to removably hold the assembly **27** in the rear end of the pencil **15**, a generally tubular eraser cup holder **31** is provided. The holder **31** is secured as by means of a staking **32** to a plunger member **33** which is preferably molded of a suitable plastic. The upper or rearward end of the cup holder **31** is tubular and has an internal diameter that slidably grips the cup **28** when the assembly **27** is fully inserted into the holder **31** with the lower marginal edge of the ferrule **29** in engagement with an internally extending annular shoulder **35** provided on the holder **31**. Preferably, the shoulder **35** is formed by crimping the cup-holder **31** at the desired location.

As shown in FIGS. 1 and 2, the barrel trim member **24** includes a rear end opening **37** through which the button **28** slidably extends and which has a diameter less than the external diameter of the holder **31**. The bore **38** in the remainder of the trim member **24** is, however, slightly greater than the external diameter of the cup **31** whereby the cup is free to reciprocate in the barrel although it cannot be removed through the opening **37**. The plunger **33** includes a cylindrical body portion **40** terminating at its lower end in a pair of integrally molded camming fingers **41** and **42**. The fingers **41** and **42** are spaced apart by one hundred and eighty angular degrees and have respective lower camming faces **41***a* and **42***a* which are generally curved in a concave direction and which are adapted to abuttingly engage the rearmost end **44** of a lead chamber member **68** of the lead cartridge unit **20**, and to engage complemental cam surfaces of alternative forms of writing units for the casing of the pencil **15**, as hereinafter explained.

The forward or leading edges **41***a* and **42***a* of the fingers **41** and **42** abut against the rearward face of the end **44** which is slidably fitted in a tubular cartridge shell **50**. The end **44** has an enlarged rearward portion **45** which provides an enlarged surface for engagement by the leading edges of the cam surfaces **41***a* and **42***a*.

The forward end of the shell **50** is gently tapered near the forward end **50***a* and is provided with an inner annular shoulder against which abuts the rear portion of a point sleeve **52** having a rearwardly disposed external annular flange **53**. A generally tubular, elongated clutch seat member **55** has a forwardly extending nose portion which has an external surface complementary to the internal surface of the tapered portion **50***a* of the sleeve **50** and which is fixed between the sleeve portion **50***a* and a tubular bushing **57**. An internally disposed annular shoulder **58** on the shell **50** abuts against a rearwardly facing seat **60** on the exterior of the clutch seat **55** so that the point sleeve **52**, the bushing **57**, the clutch seat **55** and the shell **50** are thus formed into a fixed unitary assembly.

The clutch seat member **55** includes a rearwardly facing annular shoulder against which abuts the forward end of a coil spring **65** which abuts at its rear end against a forwardly facing annular shoulder **67** on a tubular lead magazine member **68** sealed at its rear end by a disc **69**. The lead chamber member **68** is slidably mounted and guided for longitudinal reciprocal movement within the shell **50**, and both the shell **50** and the lead chamber member **68** are preferably formed of a translucent plastic material so that the lead rods contained therein are visible when the cartridge is removed from the housing.

In order to feed the lead rods **21** from the chamber **68** into the lead advancing mechanism, there is provided a lead rod guide washer **70** press-fitted into the forward end of the lead chamber. The washer **70** includes a centrally disposed annular bore **71** which is slightly larger in diameter than the lead rods **21** which are to be used with the pencil, whereby such lead rods may pass freely therethrough. Also, the upper surface **72** of the lead guide member **70** is tapered inwardly and downwardly toward the bore **71** so that the lead rods contained in the lead chamber will slide down along the surface **72** and fall one by one into the hole **71** as the lead rods move downwardly through the feed mechanism. It will be noted that the entire forward wall of the chamber **68** tapers downwardly toward the hole **71**.

Forwardly of the guide washer **70** the rear end of a tubular point clutch member **73** is secured within the lead chamber **68**. The point clutch member **73** is part of the lead advancing mechanism and functions to guide the lead during the advancing operation and to retain the lead in the advanced position during writing. As shown, the point clutch member **73** has an enlarged rearward end providing a forwardly facing annular shoulder which abuts against a rearwardly facing annular shoulder **74** formed on the internal surface of the lead chamber member **68**. The point clutch **73** has a rearwardly facing, externally disposed annular shoulder **76** which tightly abuts the forward end of the lead chamber member **68** whereby the point clutch **73** and the lead chamber member **68** form a unitary assembly in which independent relative movement is prevented.

The point clutch member **73** is generally tubular and has an internal diameter exceeding by a substantial amount the external diameter of the lead rods **21** so that the rods may pass freely therethrough. A pair of diametrically opposed slots **78** and **79** extend longitudinally through the central portion of the point clutch **73** so that a pair of diametrically opposed resilient fingers **80** and **81** on an actuating clutch **83** best shown in FIG. 8, may extend therethrough into engagement with the lead rod contained therein.

The actuating clutch **83** becomes operative during a lead advancing operation, and, after the point clutch member **73** and the lead **21** therein have been moved to a

forwardmost position by depression of the assembly **27**, serves to hold the lead in an advanced position while the point clutch member **73** moves rearwardly from the forward position shown in FIG. 2 to the position shown in FIG. 1. As shown, the clutch **83** includes a slit, ring-like lower portion **84** which surrounds the point clutch member **73** and frictionally but slidably rides on the point clutch member **73** for movement therewith between a forward position where the lower portion **84** abuts a shoulder in a clutch bushing **57** and a rear position where the fingers **80** and **81** are forced in against the lead **21** by the conical inner surface of the sleeve **55**. The fingers **80** and **81** have reversely bent marginal end portions providing arcuate lead engaging surfaces.

In order to grip the lead rod **21** disposed in the point clutch member **73** to hold it in an advanced position during writing, the forward end of the point clutch member **73** is split by a plurality of longitudinal slots **86**, preferably three in number, and the forward end of the point clutch member includes an enlarged, conical external surface **88** so that as the point clutch member **73** is moved rearwardly into the sleeve **52** the forward finger portions are compressed tightly against the lead rod. The inner surfaces **89** near the forward end of the point clutch member **73** are serrated to provide a better gripping surface for firmly engaging the lead rod **21**. It will be understood that the forward end of the point clutch member **73**, when in an unstressed condition, has an internal diameter that slidably engages the lead rods **21** sufficiently to prevent the lead rods from sliding out of the member **73**. When the point clutch member **73** is fully retracted into the sleeve **52** as shown in FIG. 1, however, the clutch fingers formed by the slots **86** are compressed tightly by the sleeve **52** against the lead rod **21** to prevent the lead rods from sliding rearwardly.

As discussed above, reciprocation of the actuator assembly **27** is used to advance the lead rods in the cartridge **20**. In order to bias the pencil cartridge **20** rearwardly against the actuator plunger **33**, a coil spring **92** is compressed between an annular, rearwardly facing shoulder near the longitudinal center of the point member **17** and the forward end of the cartridge shell **50**. When the actuator assembly **27** at the rear end of the pencil is depressed, the lead chamber **68** and the point clutch **73** are moved forwardly against the resilient coil spring **65** to feed a lead rod **21** through the point member **17** and out of the forward end thereof.

A release of the actuator assembly **27** permits the springs **65** in the cartridge **20** to expand and to move the lead chamber **68** rearwardly in the sleeve **50**. Inasmuch as the point clutch **73** is fixed to the chamber **68**, it also moves rearwardly in the sleeve **50**, and since the point clutch **73** frictionally carries the actuating clutch **83**, the point clutch pushes the actuating clutch **83** rearwardly such that the fingers **80** and **81** are urged inwardly by the conical inner surface of the clutch seat **55** against the lead rod **21** as shown in FIG. 3. As the point clutch **73** continues its rearward movement, the actuating clutch **83** is restrained against further rearward movement by the clutch sleeve **55**, so that the fingers **80** and **81** hold the lead rod **21** against further rearward movement. When the point clutch **73** is at the end of its rearward travel, the fingers **88** are further urged by the point sleeve **52** against the lead rod **21** to firmly hold it in a projected position exposed for writing.

In order to retract the lead rod **21** into the point clutch **73** to prevent undesired marking while the instrument **15** is carried on the person of the user, the actuator assembly should be partially depressed to release the clutch fingers of the enlarged end **88** of the point clutch **73** from the point sleeve **52** and also to slide the actuating clutch **83** forward in the sleeve **55** to permit the fingers **80** and **81** to expand out of engagement with the lead rod **21**. With the actuator assembly **27** thus partially depressed, the lead rod **21** may be pushed into the point clutch **73** by a slight, externally applied force. When the actuator assembly **27** is thereafter released, the lead chamber **68** and the point clutch **73** will retract with the lead rod **21** remaining within the point clutch **73** in a shrouded position.

While the present invention has been described in connection with particular embodiments thereof, it will be understood that many changes and modifications may be made by those skilled in the art without departing from the invention. Therefore, by the appended claims, it is intended to cover all such changes and modifications as come within the true spirit and scope of the invention.

I claim:

1. A writing instrument for use with lead rods comprising:

a tubular barrel having a forward portion and a rearward portion detachably interconnected,

an actuator assembly slidably mounted in said rearward portion for manual reciprocation in said barrel and including a manually operable actuator extending outwardly from said barrel,

a self-contained pencil cartridge disposed in said forward portion and removable as an assembled unit from said barrel when said forward and rearward portions thereof are separated, said cartridge including:

a tubular shell member, a reciprocable lead supply chamber having a permanently closed rearward end and permanently mounted on and at least partially contained in said shell member, a point sleeve secured to the front end of said shell member, and clutch means mounted in said point sleeve for operating independently of said barrel to control the feeding of lead rods from said chamber, and

means in said barrel for positioning said lead supply chamber in operating engagement with said actuator assembly.

2. A writing instrument according to claim **1** wherein said cartridge includes a spring biasing said reciprocable lead supply chamber rearwardly in said barrel.

3. A writing instrument according to claim **2** wherein said actuator assembly includes:

a plurality of symmetrically arranged angularly spaced portions that extend forwardly; and

said lead supply chamber includes an annular portion extending rearwardly from said cartridge into operative engagement with said spaced portions.

4. A writing instrument according to claim **1** wherein said cartridge, when removed as a unit from said barrel, is operative to feed lead rods from said cartridge to a writing position.

5. A mechanical pencil of the step-by-step lead-propulsion type, including:

a tubular barrel having a forward portion and a rearward portion detachably interconnected and having an axially reciprocable means at its rearward end, said reciprocable means including a manually operable actuator extending outwardly from said barrel, and

a lead cartridge unit disposed in said forward portion and removable as an assembled unit from said barrel when said forward and rearward portions thereof are separated, said cartridge unit comprising:

a tubular shell member supported in said tubular barrel,

a slidable lead chamber assembly permanently mounted on and at least partially contained in said shell member and disposed in operating engagement with the reciprocable means of the tubular barrel, said assembly comprising a lead chamber having a permanently closed rearward end and mounted in communication with a longitudinally slotted lead guide tube that terminates in a forwardmost first lead clutch means,

a point sleeve secured to the front end of said shell member for receiving said first lead clutch means,

a second lead clutch means comprising a body portion slidably disposed on said lead guide tube and a lead engaging member in register with the longitudinal slot in the lead guide tube,

clutch actuating means on said tubular shell member for moving the lead engaging member of the second lead clutch means into the longitudinal slot in the lead guide tube upon reciprocation of the lead chamber assembly within the shell member,

means resiliently urging the lead chamber assembly rearwardly of the shell member, and

means in said barrel for positioning said lead supply chamber in operating engagement with said reciprocable means.

6. A mechanical pencil according to claim 5, wherein said first lead clutch includes a plurality of radially-resilient lead-engaging fingers, said second lead clutch comprising an arcuate body portion and a plurality of radially-resilient lead-engaging jaws.

7. The invention of claim 6 wherein the lead-engaging jaws of the second lead clutch comprise spring fingers that extend from the arcuate body portion and that terminate in radially resilient rounded ends.

8. The invention of claim 6 wherein the tubular shell member and the lead chamber are transparent.

9. A lead cartridge unit for a mechanical pencil of the step-by-step lead-propulsion type that includes a forwardly opening tubular barrel member having a forward portion and a rearward portion detachably interconnected and an axially reciprocable means at its rearward end, said means including a manually operable actuator extending outwardly from said barrel, said lead cartridge unit comprising:

a tubular shell member removably supported in the tubular barrel,

a slidable lead chamber assembly permanently mounted on and at least partially contained in said shell member and having a rearwardly-disposed abutment for operating engagement with the reciprocable means of the pencil, said assembly comprising a lead chamber having a permanently closed rearward end and mounted in communication with a laterally perforate lead guide tube that terminates in a forwardmost first lead clutch means,

a point sleeve secured to the front end of sell shell member for receiving said lead guide tube,

a second lead clutch means slidably carried on said lead guide tube and comprising a body portion and a lead-engaging member,

clutch actuating means on said tubular shell member for moving the lead-engaging member transversely through the perforate lead guide tube upon rearward movement of the lead chamber assembly within said shell member,

means resiliently urging said lead chamber assembly rearwardly of said shell member, and

means in said barrel for positioning said lead supply chamber in operating engagement with said reciprocable means,

whereby said cartridge unit can be removed as an assembled unit from said barrel when said forward and rearward portion thereof are separated.

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LAWRENCE CHARLES, *Primary Examiner.*