Feb. 5, 1963 C. N. JOHNSON 3,076,437

WRITING INSTRUMENT

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FIG.1

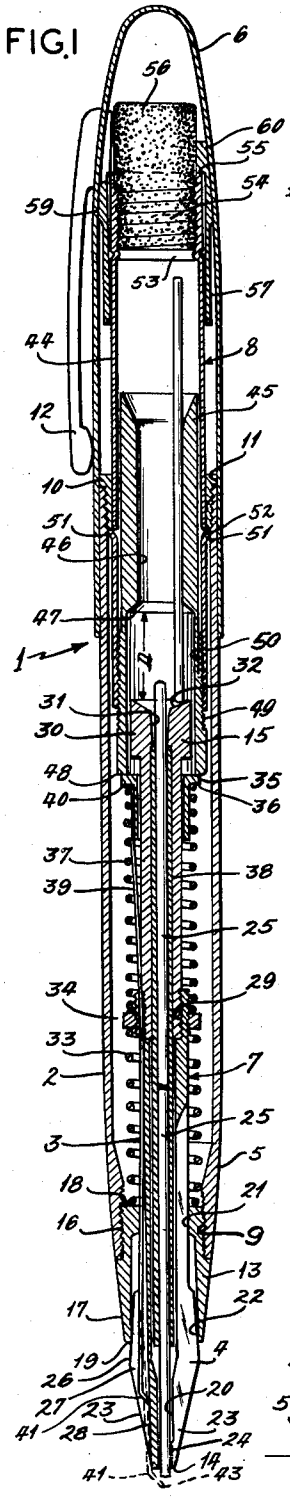


FIG.2

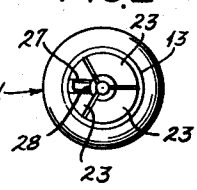


FIG.9

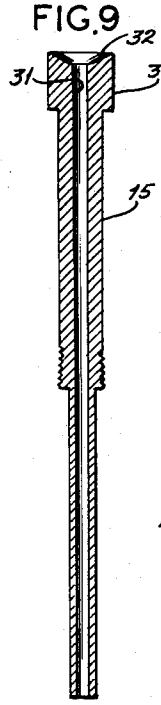


FIG.10

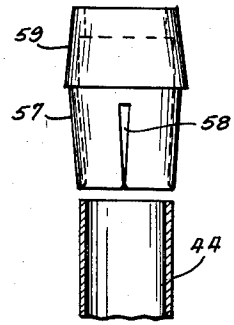


FIG.11

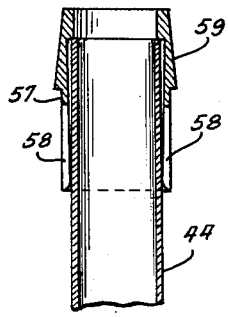


FIG.13

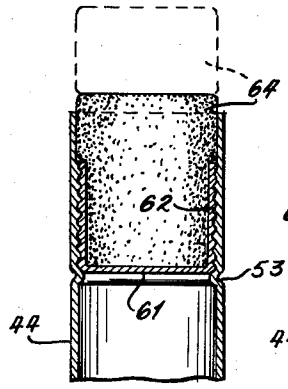


FIG.14

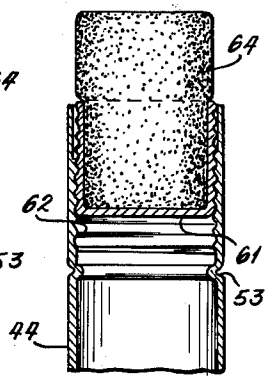


FIG.12

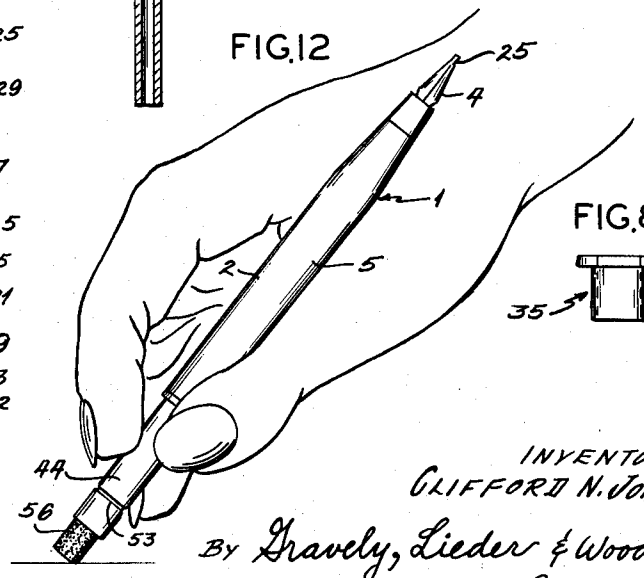


FIG.8

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FIG.3

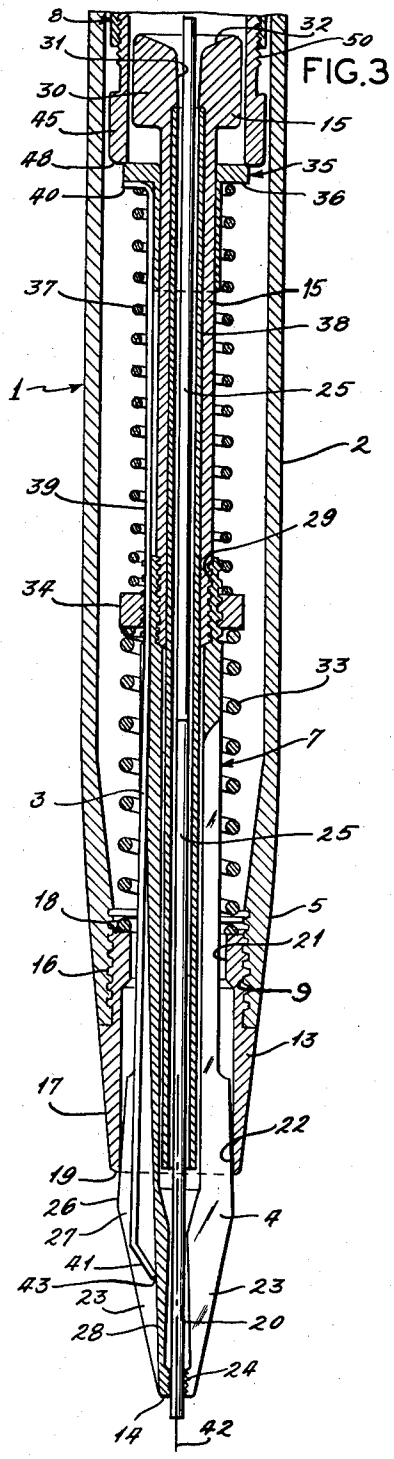
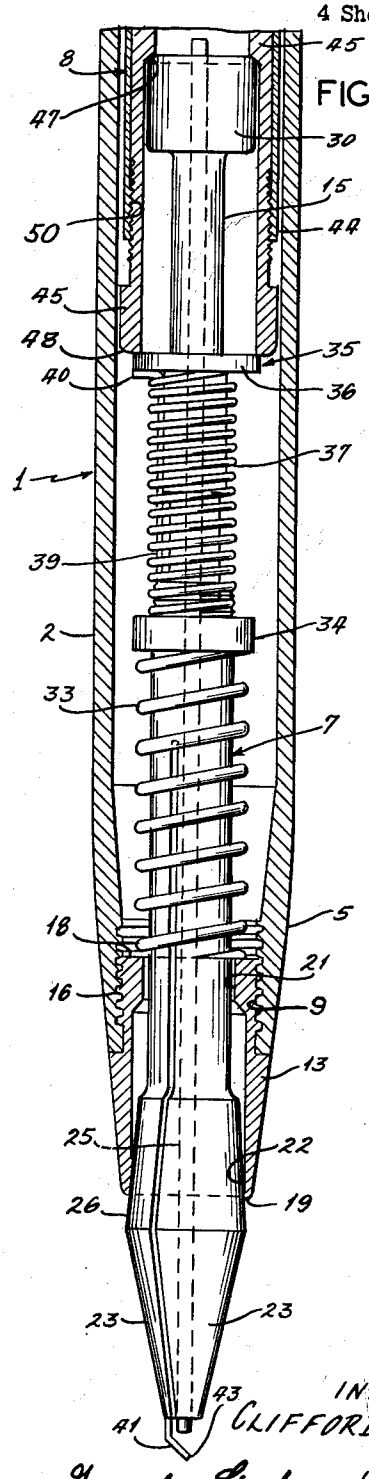


FIG.4



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FIG.5

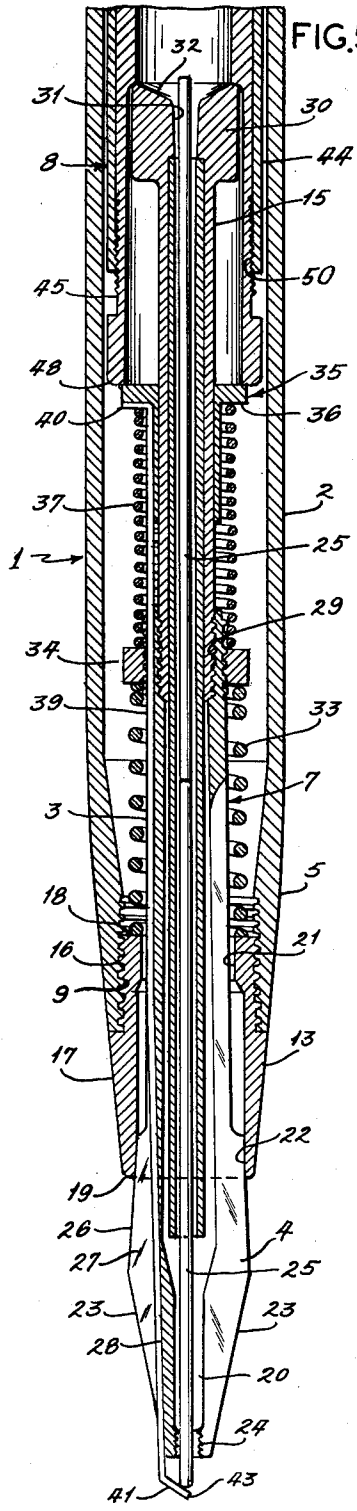


FIG.6

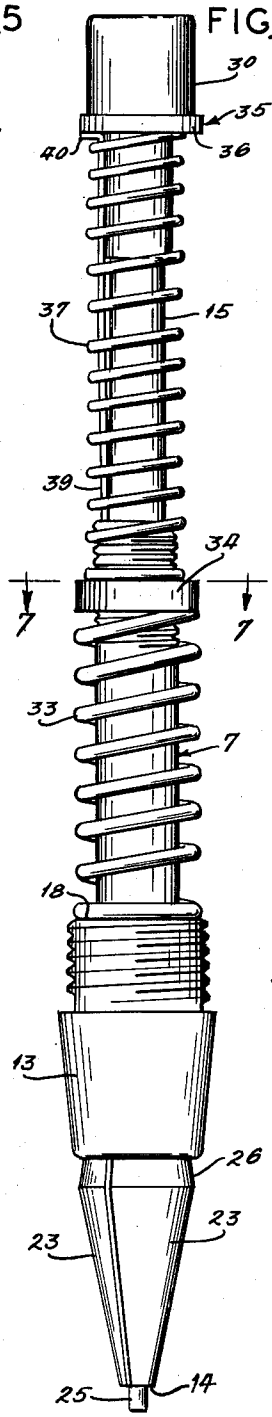


FIG.7

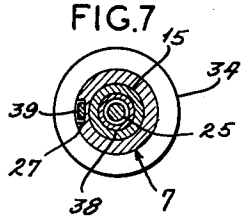


FIG.15

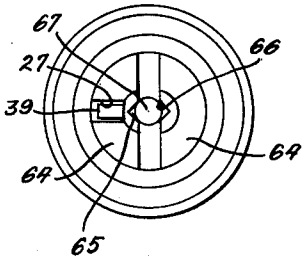
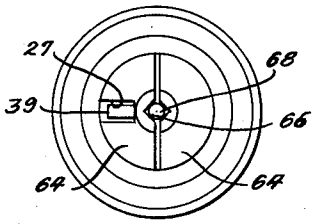


FIG.16



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FIG.17

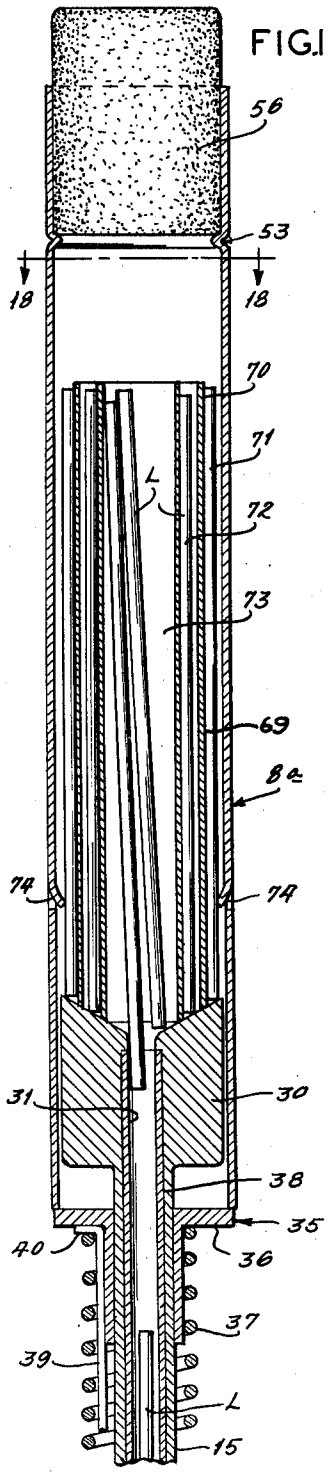


FIG.18

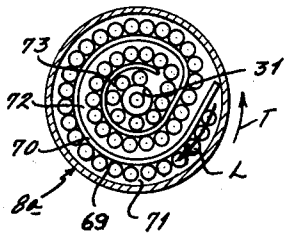
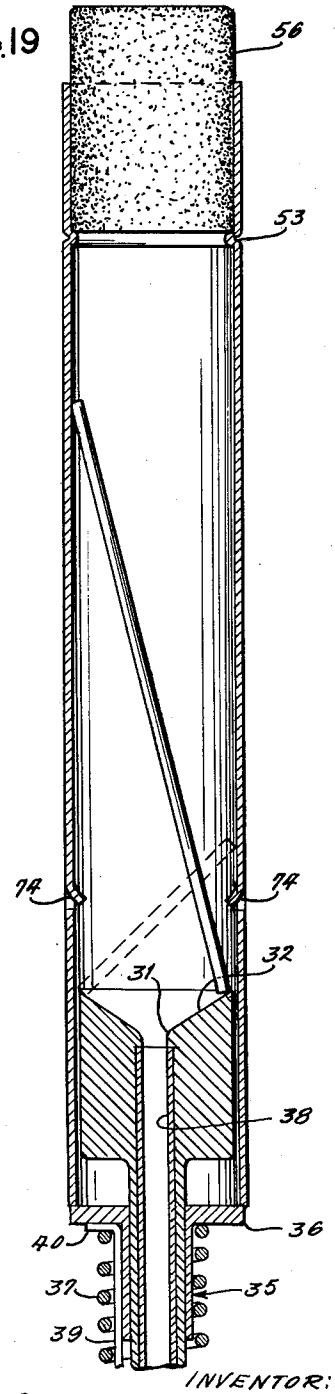


FIG.19



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United States Patent Office

3,076,437
Patented Feb. 5, 1963

3,076,437

WRITING INSTRUMENT

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Filed July 28, 1958, Ser. No. 751,412
3 Claims. (Cl. 120—22)

This invention relates to a writing instrument wherein the writing unit is allowed to fall by gravity a limited predetermined distance beyond the forward end or tip of said writing instrument when the projecting mechanism is actuated. In particular, this invention relates to a mechanical pencil wherein the writing unit or lead is allowed to fall by gravity a limited predetermined distance, which can be adjusted as desired, beyond the tip of the pencil when the writing unit stop or lead stop is actuated.

This application has subject matter in common with my co-pending application Ser. No. 587,094, filed May 24, 1956, now Patent No. 2,854,950.

The use of extra thin lead in mechanical pencils has become increasingly popular. This lead is approximately 0.036 inch in diameter and is frequently broken due to the over extension thereof from the forward tip of a pencil. It is estimated that over fifty percent of such lead is wasted since it is broken off so frequently in use. Present mechanical pencils feed the lead from the forward end of the pencil in many different ways, such as by spiral means actuated by rotation, by button means which when pushed positively moves the lead forwardly step by step, or by clutch means actuated by rotation or by a spring clutch as normally found in mechanical drafting pencils. With all of the present feed arrangements, the amount of lead which extends beyond the forward end of the pencil is not positively measured by means projecting externally from the pencil, but is visually estimated or moved by means within the pencil itself. Either way, there is no assurance that the desired amount of lead will extend forwardly from the end of the pencil.

One of the principal objects of the present invention is to positively measure by externally projecting means the amount of lead which extends externally downwardly from the forward end of a mechanical pencil, and to maintain that amount regardless of repeated actuation of the lead forwarding mechanism.

Another object of the present invention is to provide retractable stop means which is projected beyond the writing end of a writing instrument for preventing the writing unit from falling by gravity beyond a predetermined distance from the tip of the instrument regardless of how many times the lead forwarding mechanism may be actuated. Another object is to provide in a writing instrument means normally positioned within said instrument which can be projected externally thereof to limit the distance which the writing unit is allowed to project from the tip of the writing instrument and to limit this in an adjustable manner. Another object is to provide actuating means which when operated does not positively act upon or move the writing unit but simply allows the writing unit to move by gravity to its predetermined writing position. This eliminates the necessity of providing means for pushing the writing unit or lead to its new or projected position.

Another object is to provide a simple and economical commercial construction having a self-contained writing unit assembly and magazine assembly which can be easily assembled into the barrel.

Another object of the present invention is to provide a mechanical pencil wherein lead is allowed to move by gravity to its writing position upon actuation of the projecting mechanism. Another object is to provide a mechanical pencil wherein an additional supply of leads from the lead magazine will by virtue of being located one

above the other in the lead tube and resting upon one another cause the service lead to drop to its new position quickly because of the additional weight thereon when the projecting mechanism is actuated.

Another object is to provide a lead clutch or collet, part of which is located outside of the pencil barrel or casing which will firmly grip the service lead at only one point said point being located adjacent to the writing tip. Another object is to provide lead adjusting means for varying the amount which the externally projecting lead stop will allow the writing unit to fall or project beyond the writing tip.

Another object of the present invention is to provide a magazine for a repeater-type pencil having guide means therein for automatically feeding lead within the magazine to the central opening in a positive and guided manner utilizing the fact that a right-handed person normally rotates the pencil counterclockwise in his hand when looking at the eraser end when bringing a more pointed edge into contact with the paper.

Another object is to provide a large capacity magazine wherein the leads are maintained in a predetermined upright position and are guided and properly oriented with respect to the central opening.

These and other objects and advantages will become apparent hereinafter.

The invention also consists in the parts and in the arrangements and combination of parts hereinafter described and claimed. In the accompanying drawings which form part of this specification and wherein like numerals and letters refer to like parts wherever they occur:

FIG. 1 is an enlarged longitudinal cross-sectional view of a writing instrument embodying the present invention showing the lead or writing unit in its writing position after it has been worn to some extent, the dotted lines showing the extended position of the lead stop,

FIG. 2 is an end view of the writing tip of the instrument shown in FIG. 1,

FIG. 3 is a greatly enlarged fragmentary longitudinal cross-sectional view of the writing end of the instrument,

FIG. 4 is an enlarged fragmentary partial section of the writing end of the instrument with the lead stop in its projected position,

FIG. 5 is a view similar to FIG. 4 but with the jaws of the clutch in their forward and open position,

FIG. 6 is a greatly enlarged elevational view of the unitary writing assembly,

FIG. 7 is a cross-sectional view taken along the line 7—7 of FIG. 6,

FIGS. 8 and 9 are detailed views of the shoulder bearing and the lead selector with an integral extruded guide tube, respectively,

FIG. 10 shows the upper end of the magazine before the friction tube is applied,

FIG. 11 is a sectional view along a slot showing the friction tube assembled with said magazine,

FIG. 12 is a view of the instrument with the cap removed and in erasing position,

FIGS. 13 and 14 are fragmentary sectional views of a modified eraser holding means wherein the eraser has a threaded cap which is threaded into the magazine,

FIGS. 15 and 16 are end views similar to FIG. 2 showing a pair of modified clutch jaws having a square central opening which automatically compensates for variances in the size of the lead, as shown in FIGS. 15 and 16,

FIG. 17 is a fragmentary longitudinal cross-sectional view showing my modified magazine with guide means therein,

FIG. 18 is a cross-sectional view taken along the line 18—18 of FIG. 17, and

FIG. 19 is a fragmentary longitudinal cross-sectional view of the modified magazine without the guide means and showing one position which an unguided piece of lead might assume.

Referring now to the drawings in detail, it will be seen that the embodiment of the invention which has been illustrated comprises a writing instrument **1** having a casing **2** with a projecting mechanism **3** and clutch **4** therein. The casing **2** comprises a barrel **5** and a cap **6** thereon with a unitary writing unit assembly **7** and a magazine **8** therein.

The cylindrical barrel **5** has internal threads **9** at its forward end for receiving the writing unit assembly **7**. The upper portion of the barrel **5** is provided with a plug **10** which slidably receives the magazine **8**, said plug **10** being slightly larger in diameter than the barrel **5** to provide a bearing surface **11** for the inside of the push cap **6** having a pocket clip **12** thereon. The barrel **5** is basically tubular and preferably cylindrical for ease in manufacturing and printing names or advertisements thereon.

The writing unit assembly **7**, best shown in FIGS. 5 and 6, comprises a clutch closing tube **13**, a clutch **4** with a forward tip **14**, a lead selector **15** and various other parts. The clutch closing tube **13** has threads **16** thereon, a tapered outer surface **17**, a rear abutment **18**, and a forward portion **19**. The clutch **4** has an axial opening **20** therethrough. The clutch closing tube has an opening therethrough and a rear support **21** and a forward surface **22**. The clutch **4** slidably sets within the clutch tube **13** and is provided with a plurality of jaws **23** having teeth **24** at their forward end for gripping the writing unit or lead **25**. The outer inclined surfaces **26** of the jaws **23** slide with respect to the surface **22**. One of said jaws **23** is provided with a slot **27** having a bottom **28**. The rear portion of said clutch **4** is provided with internal threads **29** for receiving the forward end of the lead selector **15**, which is provided with an enlarged head or rear portion **30** with an opening **31** therethrough and a surrounding concave or conical surface **32**.

A clutch closing spring **33** is mounted between the rear surface **18** of the clutch closing tube **13** and a rotatable clutch adjusting nut **34** for normally biasing said clutch **4** and nut **34** upwardly. A sleeve bearing **35** having a shoulder **36** thereon is slidably mounted on said lead selector **15** which is circumscribed by a lead stop spring **37** positioned between upper surface of said clutch adjusting nut **34** and the lower surface of said shoulder **36** for normally biasing said members apart. A thin walled lead guide tube **38** is mounted within the clutch **4** and lead selector **15** for preventing lead from adhering to the teeth **24** of the jaws **23**. If desired, the tube **38** may be formed integral with the lead selector **15** as shown in FIG. 9.

A lead stop **39** is provided in the longitudinal slot **27** in the clutch **4** and extends rearwardly and terminates in a bent portion **40** which abuts against the sleeve bearing **35**. The lead stop **39** has a tip **41** which is bent angularly inwardly toward the geometric axis **42** of the writing instrument and has a sliding edge **43** thereon which slides on the bottom **28** of the slot **27** in the clutch **4**. The angle between the tip **41** and the geometric axis **42** is preferably 45° or less. The lead stop **39** is made from thin resilient metal and the tip is adapted to spring automatically into alignment with the lead **25** to prevent the same from falling out of the opening **20** and to position the amount to which it extends.

The magazine assembly **8** comprises an outer magazine **44** and an adjustable magazine insert **45** having an enlarged or inwardly extending wall portion **46** to reduce the internal diameter and more properly support the lead therein. The enlarged wall portion **46** has a forward shoulder **47** adapted to abut against the top **32** of the lead selector **15**. The magazine insert **45** also has a forward edge **48** in contacting relation with the sleeve type slide bearing **35**, and external threads **49** which receive internal threads **50** on an outer lead magazine **44**.

The outer magazine **44** is provided with prongs **51** which abut against a lower surface **52** on the plug **10** and an indentation **53** forming an eraser receiving chamber **54** at the upper end thereof. An edge **55** is turned over at one point on a helical angle to cut a thread into an eraser **56** as it is initially screwed into the chamber **54**. A tube **57** having slots **58** therein frictionally fits over the upper end of the magazine **8** and is provided with an outer bearing surface **59** to properly position the cap **6** on the barrel **5**.

It is believed that the operation of the writing instrument **1** is obvious from the foregoing description. Referring to FIG. 1, wherein all parts are shown in their assembled relation, if it is desired to project a piece of lead **25** or change the adjustment of worn projected lead, the cap **6** is pushed downwardly with respect to the barrel **5**. In so doing, the cap **6**, by reason of its tapered inner surface **60** cooperating with the bearing surface **59** of the tube **57** forces the outer magazine **44** and magazine insert **45** downwardly thereby moving the sleeve bearing **35** downwardly causing the spring **37** to compress and the lead stop **39** to move forwardly to the position shown in FIG. 4. In this position, the shoulder **47** is contacting the lead selector **15**. Continued downward pressure on the cap **6** moves the lead selector **15** and clutch **4** with the clutch adjusting nut **34** downwardly against the force of the clutch spring **33** thereby moving the clutch jaws **23** downwardly into open position as shown in FIG. 5 so that lead **25** may freely fall through the enlarged central opening **20** until it is stopped by the lead stop **39** in the desired extended position.

The pressure on the cap **6** is then released which first causes the clutch jaws **23** to move upwardly and inwardly by reason of the clutch spring **33** to close the opening so that the jaw teeth **24** bite into the properly extended lead **25** at the writing tip **14** of the instrument. Thus, the lead is fixed with respect to the clutch **4**. Continued release of the pressure on the cap **6** causes the spring **37** to force the projecting mechanism and the cap **6** upwardly and move the lead stop **39** upwardly to its retracted position as shown in FIG. 1. At the same time and due to the same force the magazine **8** and the magazine insert **45** move upwardly and the shoulder **47** moves out of contact with the lead selector **15**.

Referring to FIG. 1, it is seen that the radial pressure on the clutch jaws **23** can be varied by rotating the clutch adjusting nut **34** to increase or decrease the pressure on the clutch spring **33**. Moving the nut **34** toward the clutch closing tube **13** compresses the spring **33** and moving the nut **34** upwardly releases the spring **33**.

To adjust or vary the distance which the lead stop **39** extends beyond the tip **14**, the outer magazine **44** is rotated in relation to the magazine insert **45** thereby moving the magazine insert **45** upwardly or downwardly to change the position of sleeve bearing **35** with respect to the writing tip. However, this does not change the distance D between the shoulder **47** and the top of the lead selector. The bearing **35** is initially positioned out of contact with the enlarged head **30** of the lead selector **15** to allow adjustment in either direction. If the magazine insert **45** is screwed into the outer magazine **44**, the lead stop **39** moves upwardly or to a more rearwardly position and cannot be extended as far from the writing tip **14**.

The barrel **5** is short, as best seen in FIG. 12, so that in erasing the operator is able to grasp the magazine itself and not the barrel. This gives a positive erasing action and does not allow the magazine to bob up and down when erasing, as might be the case when the barrel is grasped. The bobbing is due to the fact that the force of erasing might overcome the force of the spring **37** so as to cause the barrel and magazine to move relative to one another.

FIGS. 13 and 14 show a modified eraser holder **61** in

which the upper portion of the outer magazine **44** is provided with internal threads **62** which are adapted to receive the threaded holder **61** of an eraser **64**. An annular groove **53** is also provided to form a stop means for the eraser holder **61** as in the form shown in FIG. 13. FIG. 14 shows the eraser **64** and holder **61** in their extended position such as when the eraser is partially worn.

FIGS. 15 and 16 are end views of a pair of modified clutch jaws **64** having a substantially square opening **65** formed by reason of each jaw **64** having a V-notch **66** therein whose sides are perpendicular to each other. FIG. 15 shows the jaws **64** open for receiving a relatively thick piece of lead **67**, whereas FIG. 16 shows these same jaws **64** closer together for grasping a relatively thin piece of lead **68**. In this arrangement, only two jaws are provided.

FIGS. 17 and 18 show a modified magazine **8***a* having guide means **69** therein which contain a large number of individual pieces of lead in a substantially upright position. Mechanical pencils of the repeater type (that is, where one lead after another is automatically fed from the magazine to the writing opening upon actuation of a button or cap at the upper end of the pencil) have in the past had an inherent disadvantage: in order for the lead to drop through the relatively small central hole **31** in the lead selector **15**, the lead must stand substantially upright. This requires the magazine to have a small diameter to prevent the lead, especially small or broken pieces, from assuming steep angles as shown in FIG. 19.

Because of this, magazines of present repeater type pencils have a small inside diameter of between about ⅛ inch to 5/32 inch if 0.036 inch diameter lead is used and about 5/32 to 3/16 inch inside diameter if 0.046 inch diameter lead is used. Because of this, it was recommended to insert only about six to eight pieces of lead into the magazine so that they would not be too tightly compacted and would be free to fall through the relatively small central opening. However, when few pieces were positioned in a magazine as recommended, the lead was free to assume the position shown in FIG. 19.

In my present construction, the magazine **8** may be provided with an enlarged wall section **46** to properly position the lead, or as shown in FIGS. 17 and 18, may be provided with what might be termed a spiral guide member **70** fixedly or loosely positioned in the magazine **8***a*. This properly positions the lead and increases the capacity so that several dozen pieces of lead, even as many as forty or more, may be placed in the magazine **8***a* and fed in a guided manner to the small central opening **31** in the lead selector **15**.

As shown by the arrow L in FIG. 18, the lead moves spirally inwardly until it reaches the center opening **31**. The counter-clockwise arrow T shown on the outside of the magazine **8***a* in FIG. 18 represents the normal direction of twist or rotation by a righthanded person when bringing a sharper point to bear on the paper. It has been found that persons who write with their right hand usually rotate a pencil counter-clockwise when changing the position of the lead. This normal tendency determines the direction of the spiral guide means **70** and automatically causes the lead to move from the outer chamber **71** to the intermediate chamber **72** to the inner chamber **73** from which it enters the opening **31**. Another influence which causes the lead to automatically move spirally inwardly is the conical surface **32** on the lead selector **15** which forms the bottom of the magazine. This surface **32** is higher at the outside than at the central portion so that the leads move downwardly by gravity as they move inwardly.

Projections **74** are struck from the wall of the magazine to act in the same manner as the forward shoulder **47** of the enlarged wall section **46** to move the lead selector **15** when actuating the mechanism. The projections **74** are better seen in FIG. 19 wherein the spiral guide means **70** has been omitted for clarity and to show improper positions which pieces of lead may otherwise assume if guide means are not provided.

This invention is intended to cover all changes and modifications of the examples of the invention herein chosen for purposes of the disclosure, which do not constitute departures from the spirit and scope of the invention.

What I claim is:

1. In a writing instrument, a unitary self-contained writing assembly comprising a lead selector and a clutch connected thereto at all times, said assembly having an opening therethrough for receiving lead, said clutch having jaws thereon with outer inclined surfaces, a clutch closing tube circumscribing said said clutch jaws at said inclined surfaces, a member connected to the upper portion of said clutch, a clutch closing spring positioned between said member and said clutch closing tube for biasing the latter against said inclined surfaces, said lead selector having a head thereon, a bearing slidably mounted on said lead selector beneath said head, a lead stop extending longitudinally over a major portion of said writing assembly, said lead stop having an upper end portion terminating at said bearing and a lower end portion positioned in a slot in one of said jaws, a lead stop spring positioned between said member and the head for biasing the upper end of the lead stop upwardly, said springs contacting opposite sides of said member, said lower end portion being adapted to extend downwardly in spaced axial alignment beyond the bottom of said opening in said clutch thereby compressing said lead stop spring.

2. In a writing instrument, a unitary self-contained writing assembly comprising a lead selector and a clutch connected thereto at all times, said assembly having an opening extending therethrough for receiving lead, said clutch having jaws thereon with outer inclined surfaces, a clutch closing tube circumscribing said clutch jaws at said inclined surfaces, a member connected to the upper portion of said clutch, a clutch closing spring positioned between said member and said clutch closing tube for biasing the latter against said inclined surfaces, said lead selector having a head in the upper portion thereof, a bearing slidably mounted on said lead selector beneath said head, a lead stop extending longitudinally over a major portion of said writing assembly, said lead stop having a bent upper end portion contacting said bearing and a lower end portion positioned in a slot in one of said jaws, a lead stop spring positioned between said member and the bent upper end portion for normally biasing the lead stop upwardly, said springs contacting opposite sides of said member, said lower end portion being adapted to extend downwardly in spaced axial alignment beyond the bottom of said opening in said clutch.

3. In a writing instrument, a self-contained writing assembly comprising a lead selector and a clutch connected therebelow, said lead selector and said clutch having an opening extending entirely therethrough, said clutch having jaws therein with outer inclined surfaces, a clutch closing tube circumscribing said clutch jaws at said inclined surfaces, clutch adjustment means mounted on said clutch, a clutch closing spring positioned between said clutch adjustment means and said clutch closing tube for biasing the latter against said inclined surfaces to move said jaws inwardly and close said opening, said lead selector having a head thereon, a bearing slidably mounted on said lead selector beneath said head, a lead stop spring positioned between said clutch adjustment means and said bearing for biasing said bearing toward said head, a lead stop extending longitudinally over a major portion of said writing assembly, said lead stop positioned within a slot in one of said clutch jaws and having an end portion contacting said bearing and being biased upwardly by said lead stop spring, said lead stop having a lower tip normally positioned within the slot in said jaws and adapted

to extend downwardly therebeyond in spaced axial alignment with the opening in said clutch means.

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