Feb. 5, 1963 C. N. JOHNSON 3,076,438

WRITING INSTRUMENT

Filed June 17, 1959 2 Sheets-Sheet 1

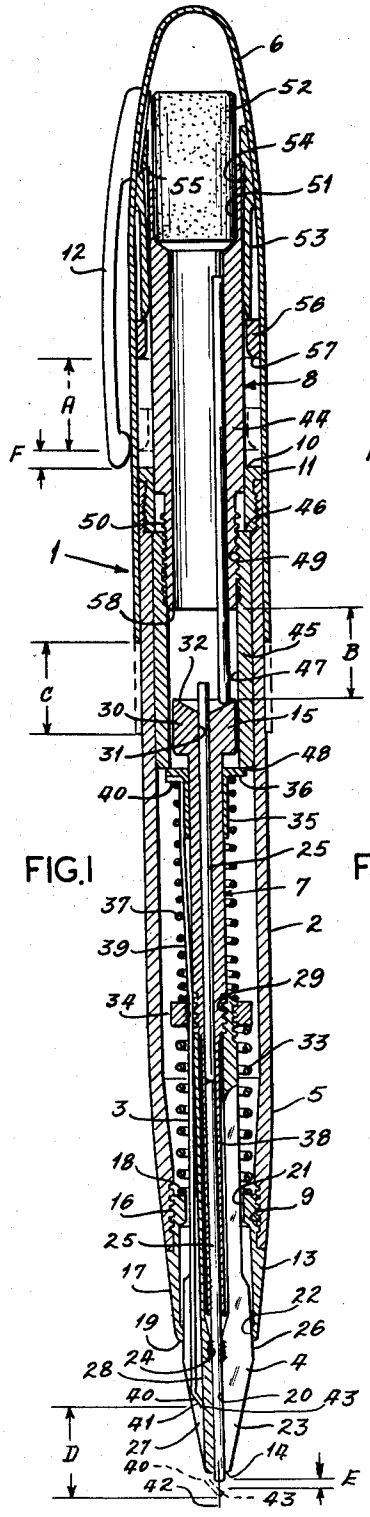


FIG. 1

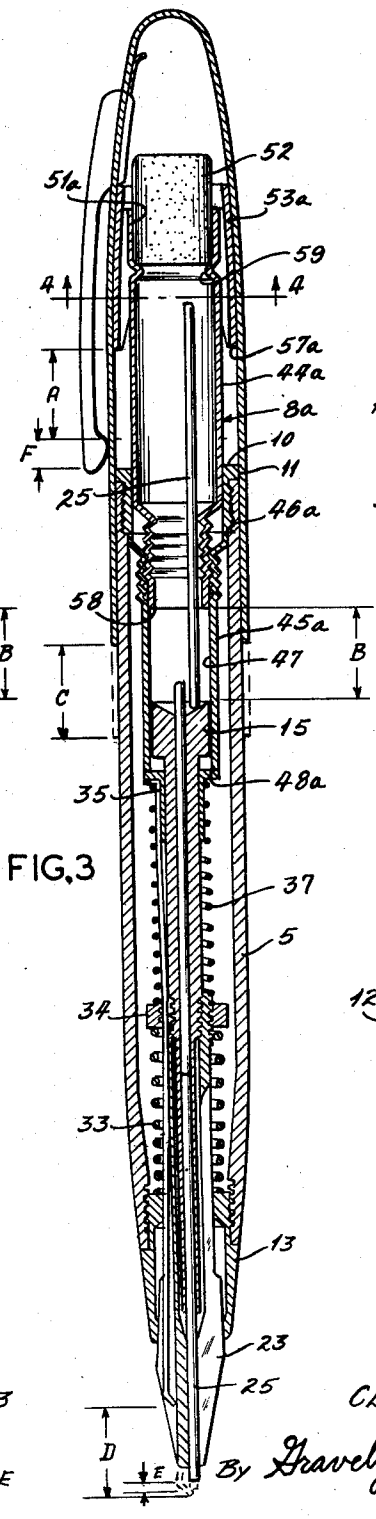


FIG. 3

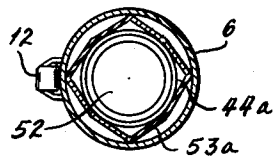


FIG. 4

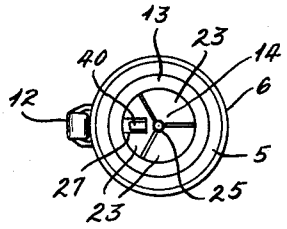


FIG. 2

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Feb. 5, 1963 C. N. JOHNSON 3,076,438

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Filed June 17, 1959 2 Sheets-Sheet 2

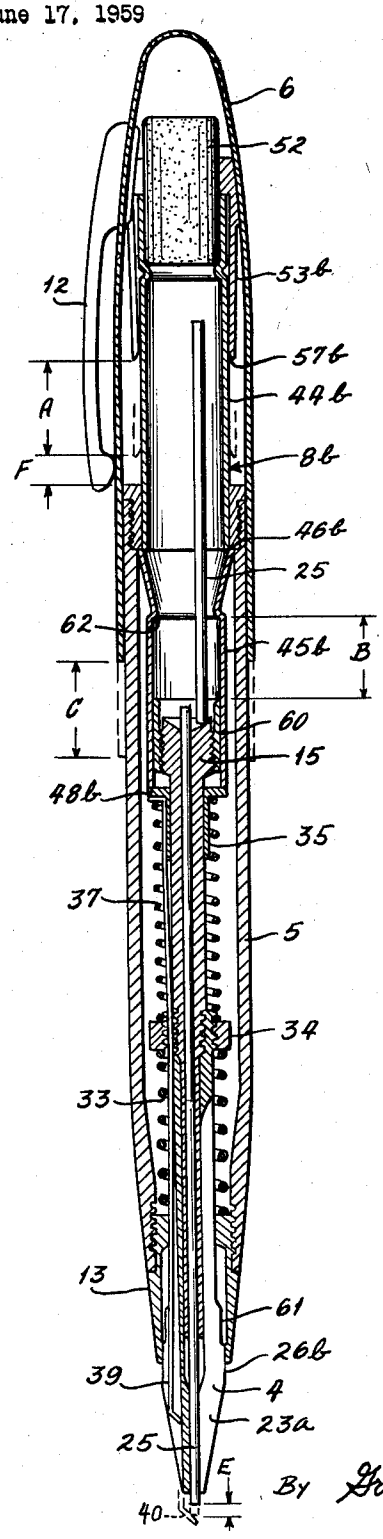


FIG.5

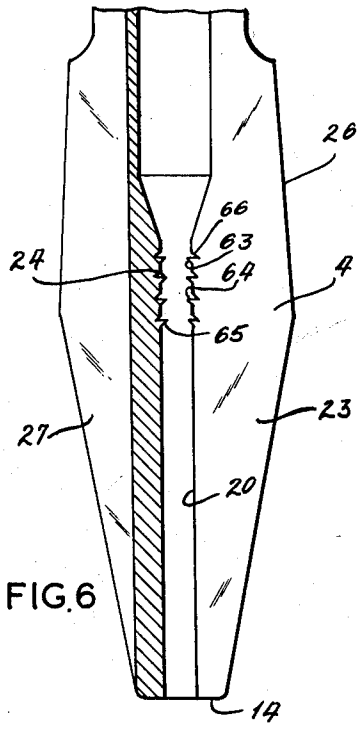


FIG.6

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United States Patent Office 3,076,438 Patented Feb. 5, 1963

3,076,438

WRITING INSTRUMENT

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Filed June 17, 1959, Ser. No. 820,982
2 Claims. (Cl. 120—22)

This invention relates to a writing instrument wherein the writing unit is projected forward by the force of inertia, either with or without the aid of 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 projected forward by inertia a limited predetermined distance beyond the tip of the pencil, which distance can be adjusted as desired.

This application is an improvement on the writing instrument shown in my Patent No. 2,854,950, dated October 7, 1958, and has subject matter in common with my co-pending application Ser. No. 751,412, filed July 28, 1958.

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, other than shown in my Patent No. 2,854,950, 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 said 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.

In the instrument shown in my Patent No. 2,854,950, the lead moves by the force of gravity to and from its operative position so that the instrument must be properly positioned in order to effect a desired movement of the lead.

One of the principal objects of the present invention is to provide in a pencil of the type wherein the amount of projecting lead is measured by an external stop, means for causing the lead to be propelled by inertia against said stop so that the movement of the lead is not by reason of gravity alone. Another object is to provide in a device of this type an arrangement which will propel the lead and will also produce an audible or clicking sound which indicates to the user that the lead has been propelled.

Another object is to provide new means for adjusting the distance that the lead stop will extend beyond the tip of the pencil.

Another object is to provide a new clutch or collet which has limited opening to prevent the lead from falling out of the pencil due to misalignment of the stop and to prevent the lead from getting caught in the jaws of the collet.

Another object is to provide novel means for gripping the service lead over the entire contacting surface of the jaws beyond the forward end of the clutch closing tube to assure a positive grip on the service lead, and to provide means for preventing the lead from backing up into the instrument during normal writing.

Another object 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 this amount regardless of repeated actuation of the lead forwarding mechanism.

Another object of the invention is to provide retractable stop means which is projected beyond the writing end of a writing instrument for preventing the writing unit from moving 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 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 causes the writing unit to move, either with or without the aid of gravity, to its predetermined writing position in a guided manner so that it will contact the lead stop.

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

These and other objects and advantages will become apparent hereinafter.

The invention also consists in the parts and in the arrangement 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 in its writing position after it has been worn to some extent, the dotted lines showing the extended position of the lead stop and the extended position of the sleeve within the cap,

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

FIG. 3 is an enlarged longitudinal cross-sectional view of a modified form of the invention,

FIG. 4 is a transverse cross-sectional view taken along the line 4—4 of FIG. 3,

FIG. 5 is an enlarged longitudinal cross-sectional view of a further modified form of the invention, and

FIG. 6 is an enlarged fragmentary view of the inner faces of the clutch jaws with projections or teeth therein.

Referring now to FIGS. 1 and 2 of 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 push means or 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, which has 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 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 inner surface 22. The clutch 4 slidably sets within the clutch tube 13 and is provided with a plurality of jaws 23 having inwardly projecting teeth 24 positioned rearwardly of the forward tip 14 for gripping the writing unit or lead 25 so that it does not back up into the instrument during writing. The jaws 23 preferably contact the lead 25 over their entire distance forwardly of the teeth 24. 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. The opening 31 is slightly larger, about 0.010 inch, than the lead to be used in the pencil.

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 on the lower portion of the lead selector 15 extends within the clutch 4 for preventing lead from adhering to the teeth 24 or other surfaces of the jaws 23. If desired, the tube 38 may be made separate from the lead selector 15 as explained in my co-pending application Ser. No. 751,412.

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 when the clutch 4 is opened and to position the amount to which it extends.

The magazine assembly 8 comprises an upper magazine 44 and an adjustable lower magazine 45 with an upper edge 46 and a bore 47 of uniform diameter. The lower magazine 45 also has a forward edge 48 in contacting relation with the sleeve type slide bearing 35, and internal threads 49 which receive external threads 50 on the upper magazine 44. The upper magazine 44 is provided with an eraser receiving chamber 51 in the upper end thereof for receiving an eraser 52. A tube 53 in the cap 6 has vertical slots therein and frictionally fits over the upper end of the magazine 8 and is provided with an inner bearing surface 54 to properly position the cap 6 with respect to the magazine 8 and the barrel 5. A shoulder 55 in the tube 53 is adapted to engage the upper edge of the upper magazine 44 to transmit the downward movement of the cap 6 to the magazine 8. The tube 53 has a sleeve 56 at its lower end. The sleeve 56 is pressed into the cap 6 adjacent to the bottom of the tube 53 and has its lower edge 57 positioned at a predetermined distance from the plug 10 when the cap 6 is in its normal inoperative position. This distance, and its amount, are very important, as are the other distances hereinafter described.

It is believed that the operation of the writing instrument 1 is clear from the foregoing description, especially in view of my co-pending application Ser. No. 751,412. Referring to FIG. 1, if it is desired to project a piece of lead 25 or change the adjustment of the worn projected lead, the cap 6 is pushed downwardly with respect to the barrel 5. With the present arrangement, the operation of the mechanism causes the lead 25 to be propelled by the force of inetria instead of being allowed to fall downwardly against the bent portion 40 of lead stop 39 solely by gravity when the pencil is held in an upright position. Even when the pencil is held in a horizontal position, the present arrangement allows the lead 25 to be propelled or shot forward after the collet jaws 23 are opened. Of course, the same action occurs in all positions between the horizontal and vertical point down positions. This is accomplished by the force of inertia in the following manner.

When the cap is moved downwardly or forwardly a distance A, the lower edge 58 of the upper magazine 44 moves forward a distance B, the lower edge of the cap 6 moves forward a distance C, and the lead stop 39 moves forward a distance D. This leaves a space E if the lead has been shortened by use and there is still a space F to be traveled by the cap 6. Up to this time in the operation of the lead forwarding mechanism, the operator's thumb has been opposed only by the reaction force of the relatively light lead stop spring 37. Considerably more pressure is required to close the space F, the amount of which is very critical, because the space B has already been closed by reason of the lower edge 58 of the inner or upper magazine 44 contacting the outer edge of the surface 32 on the lead selector 15, so that continued downward movement must also be against the reaction force of the stronger collet closing spring 33 as well as the lead stop spring 37.

At this time there may be a momentary pause in the operation of the pencil while enough extra force is added to the end of the cap 6 to break the clutch 4 loose from the clutch closing tube 13. This added force causes the small space F to close quickly, almost instantly, and then causes the mechanism to come to a sudden stop when the bottom 57 of the sleeve 56 strikes the plug 10 instantly thereafter. As the space F is closed, the clutch 4 opens to allow the lead 25 to move freely in the enlarged axial opening 20. The whole mechanism then comes to a sudden stop with the clutch 4 still open, except for the service lead 25 which at this time is free to continue to move forward by reason of inertia to the bent portion 40 of the stop 39, since it is not restrained in any way. Of course, in order for the lead to continue to move, it must have been positioned within the lead selector 15 and guide tube 38 thereon so that as the clutch 4 moves forwardly and opens, the lead is propelled out of the end of the pencil and against the bent portion 40 of the lead stop 39.

This action is similar to the operator of an automobile suddenly putting on the brakes when the car is in motion. The car is then restrained but the occupants or any objects in the car, which are not fastened to the car, will lunge forward. The sleeve 56 causes this sudden stop when it strikes the end of the screw plug 10 in the barrel 5.

Thus, the action which causes the propulsion of the lead is caused by a combination of events in which the lead stop is first properly positioned. Then force must be built up until suddenly there is a sufficient amount at which time the cap 6 and all parts surge forward with respect to the casing to gain momentum and open the clutch and then are instantly stopped, thereby resulting in an audible click and propelling the lead forwardly.

When the pressure on the cap 6 is released, it first causes the clutch jaws 23 to move upwardly and inwardly by reason of the clutch spring 33 thereby closing the opening so that the teeth 24 contact the properly extended lead 25 adjacent to the cam slope 26 of the jaws 23 of the clutch 4 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 the full lines in FIG. 1.

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 upper magazine **44** is rotated relative to the lower magazine **45** thereby moving the lower magazine **45** upwardly or downwardly to change the position of sleeve bearing **35** with respect to the writing tip. This changes the distance B between the forward edge **58** of the upper magazine **44** and the top of the lead selector **15**, since 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 upper magazine **44** is screwed into the lower magazine **45** so that the distance B is decreased, the lead stop **39** cannot be extended as far from the writing tip **14** as when the distance B is greater.

FIGS. 3 and 4 show a modified form of the device shown in FIGS. 1 and 2. In this modified form, the mechanism from the lead selector **15** to the forward tip **14** is substantially the same. The difference resides in a different magazine construction **8***a* made from two pieces of thin wall tubing **44***a* and **45***a* with rolled threads thereon. A fluted tube **53***a* within the cap **6** has a bottom **57***a* positioned to cause the sudden stop. The tube **53***a* also acts as a slight friction means to hold the cap **6** onto the magazine **8***a*.

The magazine **8***a* comprises an upper magazine **44***a* and an adjustable lower magazine **45***a* having an upper edge **46***a* which abuts against the bottom of the plug **10**. The lower magazine **45***a* has a bore **47** of uniform diameter which slides over the circumferential edge of the lead selector **15**. The forward edge **48***a* of the lower magazine **45***a* is in contacting relation with the sleeve bearing **35**. The upper portion of the upper magazine **44***a* has an eraser chamber **51***a* therein formed by a rolled groove **59** for holding the eraser **52**.

This is a less costly construction but operates substantially the same as the device shown in FIG. 1. In operation, the cap **6** is pushed downwardly against the slight reaction force of the spring **37** to close the space B. Thereafter a surge of force must be applied to move the bottom edge **58** of the upper magazine **44***a* and the lead selector **15** downwardly against the additional reaction of the stronger clutch closing spring **33** to open the clutch **4**. The extra force which is applied is so great and is stopped so suddenly when the bottom **57***a* of the tube **53***a* within the cap **6** strikes the upper edge of the plug **10**, that the lead **25** continues its forward travel all the way to the lead stop **39**.

Obviously the space B can be increased or decreased by threading the upper magazine **44***a* into or out of the lower magazine **45***a*. This changes the space E causing the service lead **25** to extend different distances from the writing tip of the pencil.

A further modification is shown in FIG. 5 wherein the parts are substantially the same as in the two previous forms except as follows. The lead selector **15** is provided with external threads for receiving a threaded sleeve **60** which can be rotated relative thereto. The magazine **8***b* has an upper portion **44***b* and a lower portion **45***b* which has an upper edge **46***b* adapted to contact the lower edge of the plug **10** and a bottom edge **48***b* adapted to contact the sleeve bearing **35**. The tube **53***b* within the cap **6** is like that shown in FIG. 3. Thus the distance B can be varied in a different manner by rotating the threaded sleeve **60** with respect to the lead selector **15** to either increase or decrease the distance B.

Another difference is found in the clutch **4** which in this instance has a shortened inclined surface **26***b* with a straight portion **61** inwardly therefrom. The straight back end **61** of the clutch **4** is parallel to the axis **42** and eliminates the possibility of the jaws **23***a* from opening too much so as to cause the lead **25** to slip past the bent portion **40** of the lead stop **39** and fall completely out of the pencil. It also makes the clutch **4** less critical to manufacture. This feature also prevents short pieces of thin lead getting caught between the jaws **23***a* of the collect as might otherwise happen. The surfaces **61** are parallel to the geometric axis **42** so that the jaws do not open beyond a predetermined amount regardless of the extent of the longitudinal movement.

In operation of the device in FIG. 5, a downward force on the cap **6** causes the lower magazine **45***b* to move the sleeve bearing **35** downwardly against the slight reaction of the lead stop spring **37** until the shoulder **62** formed in the lower magazine **45***b* abuts against the upper edge of the threaded sleeve **60**. A surge of greater pressure must then be applied to cause greater downward movement of the entire mechanism against the stronger force of the clutch spring **33** to open the jaws **23***a* a limited predetermined amount due to the straight outer edges **61** thereon thereby propelling or carrying the lead **25** with the parts until the bottom edge **57***b* of the tube **53***b* strikes the top edge of the plug **10**, at which time the parts abruptly stop their forward movement. However, the lead **25** therein continues on its way forward under inertia until it is stopped by the bent portion **40** on the lead stop **39**.

In each of the devices shown in FIGS. 1, 3 and 5, the parts are arranged so that the forward movement of the parts is abruptly stopped with the clutch jaws **23** being in their open position so that the lead **25** can continue its forward movement by reason of inertia. At this time, there occurs a clicking sound caused by the lower edge **57** striking the top end of the plug **10**. This is desirable since it informs the user that the device has been actuated and the lead has been moved to its operative position, provided the pencil has been held with the point **14** in any position from the point down position to a horizontal position.

Since it is desirable to keep the width of the lead stop **39** at a minimum, the parts must be accurately made so that the lead will not be misaligned or miss the lead stop **39**. This is accomplished by having the straight portions at the rear of the clutch **4**.

FIG. 6 shows an enlarged view of the inwardly projecting teeth **24** in the jaws **23** of the clutch **4**. The shape of the teeth is important and is designed to prevent the lead **25** from backing up into the pencil **1** by gripping it tightly. Each tooth **24** has a slanted forward portion **63** which extends rearwardly and has a straight back portion **64**. Each tooth **24** extends inwardly into the opening **20** beyond the inner surface of the jaws **23** and is formed by raising a projecting portion **65** toward the axis **42** by means of radial pressure from a steel file or other suitable instrument, thereby leaving a notch **66** in the jaw **23**. The teeth **24** should not have a portion which bites forwardly into the lead since such a shape might tend to cut or shave the lead **25** rather than to prevent rearward movement thereof. The teeth **24** should not act as cutting edges to either shear or scrape the lead when pressure is applied during writing. The teeth **24** preferably are positioned opposite the forward portion **19** of the tube **13** and bite into the lead sufficiently so that the forwardly extending portions of the jaws **23** contact the lead over its entire length from the teeth **24** to the forward tip **14** of the clutch **4**.

It is understood that the forward end as used herein and in the trade refers to the writing end shown at the bottom of FIGS. 1, 3 and 5, and that the rear end refers to the opposite end or eraser end of the instrument, shown at the top of said figures. While lead is referred to as the writing medium herein, other writing units such as thin ball point units can be used in place of lead if de-

sired to position the ball predetermined distance from the forward end of the instrument.

This invention is intended to cover all changes and modifications of the example 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. A writing instrument having a writing assembly comprising a lead selector and a clutch connected thereto, said assembly having an opening extending therethrough for receiving lead, said clutch having jaws thereon with outer surfaces with an inclined portion and a straight portion thereon, a clutch closing tube circumscribing said clutch jaws at said 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 lead stop extending longitudinally over a major portion of said writing assembly, said lead stop having a bent upper end portion contacting said head 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 lead stop spring being relatively easy to compress but requiring a major amount of movement of the push means, said clutch spring resisting compression until sufficient additional force is applied, stop means positioned to stop said push means within a short distance after sufficient force has been applied to compress said clutch spring, thereby causing an audible sound and propelling the lead from the instrument against said external stop by reason of the inertia of the lead created therein by said movable means, said push means including two tubular pieces which can be rotated with respect to each other to adjust the distance which the lead stop projects beyond the tip of the instrument when the push means has been actuated, said clutch jaws straight portion limiting the amount of opening therebetween regardless of the amount of movement of said push means and teeth on their inner portion to bite into the lead to prevent said lead from backing up into said instrument during writing, said teeth having forward portions slanting rearwardly which extend inwardly from the inner faces of said clutch.

2. A writing instrument having a casing with an opening in the forward end thereof, a writing assembly projecting through said opening, said instrument having a barrel and a cap, longitudinally extending push means normally positioned within said writing assembly, said writing assembly having clutch jaws therein, a relatively light lead stop spring and a relatively heavy clutch spring in said barrel which must both be compressed to open said clutch jaws, said springs positioned in contracting relation on opposite sides of a member in said writing assembly, said lead stop spring being relatively easy to compress but requiring a major amount of movement of the push means, said clutch spring resisting compression until sufficient additional force is applied, stop means positioned in the upper portion of the barrel to stop said push means within a short distance after sufficient force has been applied to compress said clutch spring, thereby causing an audible sound and propelling the lead from the instrument against said external stop by reason of the inertia of the lead created therein by said movable means, said push means including two tubular pieces which can be rotated with respect to each other to adjust the distance which the lead stop projects beyond the tip of the instrument when the push means has been actuated, said clutch jaws having a straight portion on their outer cam surfaces to limit the amount of opening therebetween regardless of the amount of movement of said push means.

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