# United States Patent [19]

**Hashimoto et al.**

[11] **3,765,781**

[45] **Oct. 16, 1973**


[54] **MECHANICAL PENCIL**


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[73] Assignees: **Mitsubishi Pencil Co., Ltd.,** Tokyo; **Ancos Co., Ltd.,** Osaka, both of Japan



[22] Filed: **Jan. 22, 1971**

[21] Appl. No.: **108,785**

[30] **Foreign Application Priority Data**

Jan. 24, 1970 Japan ..... 45/6669

[52] **U.S. Cl.** ..... **401/67**

[51] **Int. Cl.** ..... **B43k 21/16**

[58] **Field of Search** ..... 401/65–67



[56] **References Cited**

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*Primary Examiner*—Lawrence Charles

*Attorney*—Ernest A. Greenside



[57] **ABSTRACT**

In an mechanical pencil having a cap nozzle at one end of a body casing and a cap means at the opposite end thereof, a lead carrying mechanism is retractably arranged within the cap nozzle and selectively operated by a mechanism operative with resilient means provided in the body casing so that in accordance with wear of the lead said lead carrying mechanism is gradually retracted into the body casing under the writing pressure.


**5 Claims, 10 Drawing Figures**

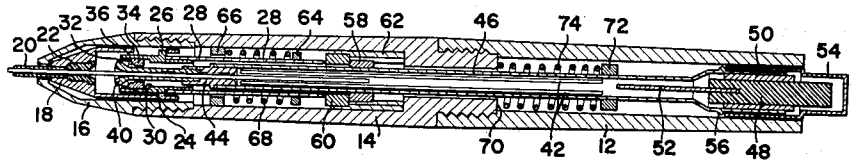


FIG. 1

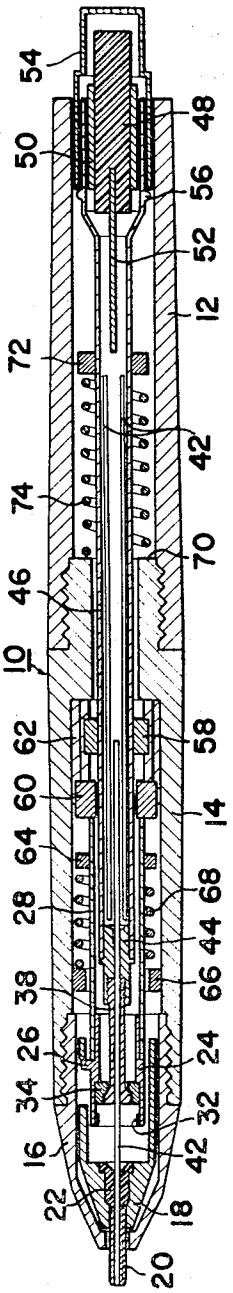



FIG. 2

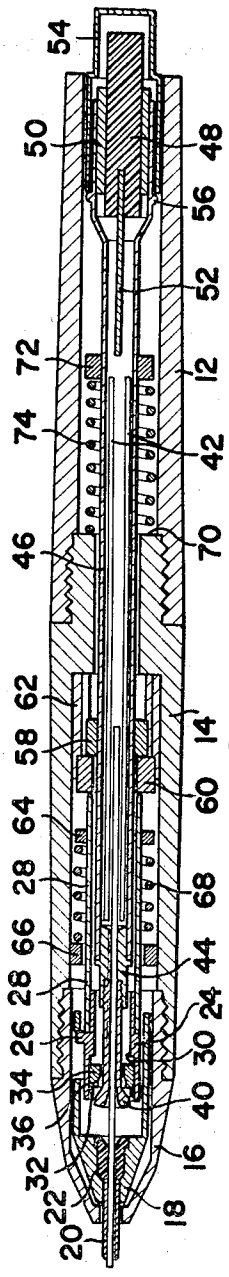



FIG. 3

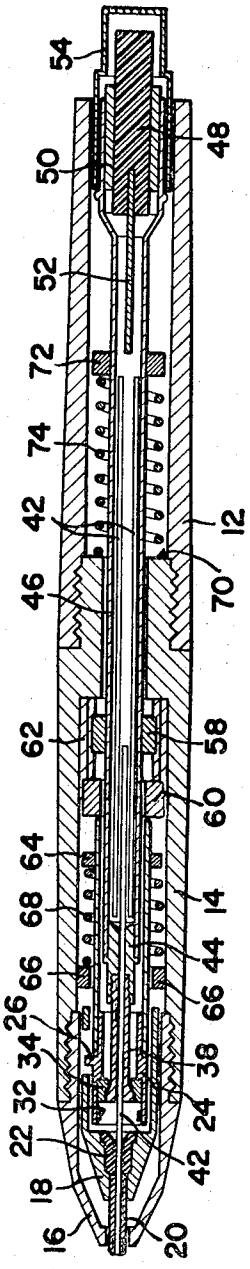


FIG. 4

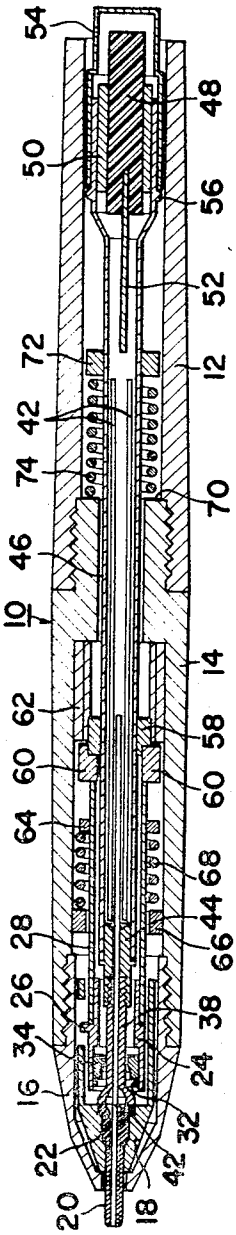
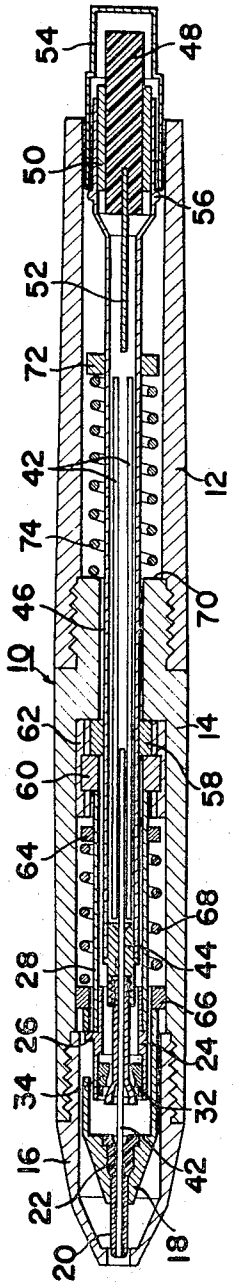



FIG. 5



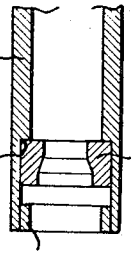




FIG. 7a

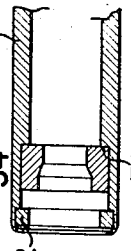



FIG. 7b

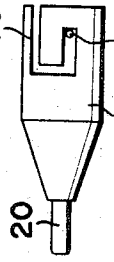



FIG. 6c

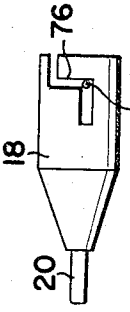



FIG. 6a

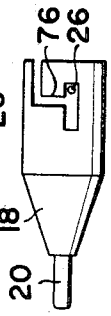



FIG. 6b

# MECHANICAL PENCIL

## BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to improvements in an mechanical pencil and, more particularly, to a pencil providing a retractable lead carrying mechanism.

A principal object of the invention is to provide a pencil in which the lead carrying mechanism is retracted spontaneously under writing pressure.

In accordance with the present invention, the tube with the lead of predetermined length is exposed from a cap nozzle by applying a strong force on an end cap to urge sliding means connected to the tube forwardly, lead being further extended by a gentle pushing operation on the cap. The sliding means is retracted in accordance with the wear of the lead under writing pressure ensuring the continuous writing operation of extended period.

Another object of the invention is to provide a pencil comprising two coupled body casings providing a cap nozzle at one open end thereof and an end cap at the opposite open end thereof, a lead carrying mechanism arranged slidably within said cap nozzle and retractable by action of a first resilient means, said lead carrying mechanism comprising sliding means and a lead holding means operably engaged with said sliding means, a core fixing means operatively connected to the push means for selectively chucking or releasing the lead, a release mechanism arranged in the middle of the pencil comprising a rotary disc means connected to the lead guide means and a push ring means mounted around a core casing connected to the core fixing means and a second resilient means for carrying the push means and the core fixing means upwardly.

In the writing operation, the lead carrying mechanism is advanced by a strong force on the end cap while extending lead of desired length with the tube, and in accordance with wear of the lead, the tube connected-,integrally to the sliding means,is retracted under the writing pressure ensuring an extended continuity of the writing operation. The lead may be extended by merely applying a gentle pushing force on the end cap **54.**

Other objects of the invention will in part be obvious and will in part appear hereinafter.

## BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and object of the invention reference should be had to the following detailed description taken in connection with the accompanying drawing, in which the same reference numerals designate the same or similar parts throughout the drawings;

FIG. 1 is a longitudinal sectional view of the pencil in accordance with the invention wherein a sliding means is positioned at the top of the cap nozzle;

FIG. 2 is a longitudinally sectioned view similar to FIG. 1 but showing parts of the pencil when subjected to a gentle pushing force to expose lead from the core pipe;

FIG. 3 is a longitudinally sectioned view similar to FIG. 1 but showing the sliding means and a tube connected thereto in retracted position occassioned by wear of the lead;

FIG. 4 is a longitudinal sectional view similar to FIG. 2 but showing the position of pencil parts when subjected to a strong pushing force effective to return the sliding means to its position shown in FIG. 1;

FIG. 5 is a longitudinal sectional view similar to FIG. 1 but showing the sliding means at its retreated position;

FIGS. 6 (a) to (c) are fragmentarily enlarged end views of three embodiments of the sliding means according to the invention; and

FIG. 7 (a) and (b) are fragmentarily enlarged sectional views of two embodiments of the fastening intermediate members.



## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now in more detail to the drawings, wherein like parts are indicated by like reference numerals and initially to FIG. **1,** there is illustrated therein in longitudinal sectional view a main body of an automatic pencil **10** made of steel, synthetic resin or other suitable materials and shaped into a hollow tube of predetermined diameter and length and divided into two body casings, i.e., an upper sleeve **12** and a lower sleeve **14** which is provided at its open end with a cap nozzle **16.**

Within the cap nozzle **16** is slidably arranged a slider **18** having at its constricted end an integrally secured tube **20** with a lead holder **22** of resilient material such as rubber, synthetic resin or the like.

The slider **18** is provided with a recess as hereinafter described. Within the cylindrical portion of the slider **18** is disposed a fastening base member **24** having on its outer periphery a projection **26** and connected to a pipe **28.** The fastening base member **24** at its internal middle portion is provided with an annular stepped portion **30** and at its inner open end portion with an annular stop ring **32.** The annular stop ring **32** may be provided by welding or caulking the ring, being received in a recessed end of base member **24** as best shown in FIG. **7** (a) and (b). A clamping ring **34** having a partially recessed portion **36,** adapted to receive an outwardly spread portion of the core fixing member hereinafter described, is slidably mounted with the base member **24** for movement between the stepped portion **30** and the stop ring **32.**

A core chucking member **38** extends through the opening in clamping ring **34** and terminates at one end in a divided and outwardly spread end portion **40** adapted to embrace a length of lead **42** so that the lead **42** may be chucked or released in accordance with engagement or disengagement of the outwardly spread end portion **40** with the clamping ring **34.** By virtue of this construction the lead **42** when clutched by the chucking member **38** may be extended beyond nozzle **16** and tube **20** by a gentle or forceful pushing operation a distance equivalent to the displacement distance of the fastening base member **24.** The chucking member **38** at its other end portion is connected to a lead guide member **44** which is in turn connected to a casing **46** so that multiple spare lead lengths stored in the casing **46** can be supplied to the lead guide member **44.**

The casing **46** at its opposite end portion is enlarged in its diameter so as to detachably accommodate an eraser **48** carried by a sheet metal member **50** encompassing the said eraser **48.** The eraser **48** is provided with a pin rod **52** for cleaning the tube **20** and the chucking member **38.** A cap **54** covers the eraser **48**

and engages a ridge 56 formed at the outer periphery of the casing 46.

The casing 46 has mounted thereon a push ring 58 having an angular end. The pipe 28 at its end portion adjacent to the push ring 58 has secured thereto a rotary disc member 60 slidable along the core casing 46, said disc member being provided at its end facing the angular end of the push ring with two or more pawls (not shown) adapted to be engaged by the angular end of the push ring 58 when the latter is moved, for example, from its FIG. 1 to its FIG. 2 position upon applying a pushing force to cap 54.

The lower sleever 14 at its upper portion is interiorly provided with a protuberance 62 having a shallow groove adapted to receive a portion of the push ring 58 and a deep groove adapted to receive a portion of the rotary disc member 60 so that the push ring 58 reciprocates, during its movement, along the shallow groove while the pawl of the rotary disc member 60 is positioned in its advanced or retreated position as shown in FIGS. 1 and 5 respectively under the influence of push ring 58 and spring 68 respectively.

The rotary disc member 60 is rotated in predetermined angular steps in consequence of the camming action provided by the engagement of the diagonal portion of the annular end of the push ring 58 with the pawls on the disc member 60.

The pipe 28 at its outer periphery is provided with a first spring stop ring 64 while the lower sleeve 14 is provided adjacent its threaded end portion with a second spring stop ring 66, a spiral spring 68 being mounted between these stops to always urge the pipe 28 toward end cap 54.

Moreover, between a threaded terminal 70 of the lower sleeve 14 and a stop ring 72 provided around the casing 46 is mounted a coil spring 74 effective to urge the casing 46 toward the end cap 54 so that the outwardly spread end portion 40 of the chucking member 38 is received in the recess 36 of clamping ring 34 to embrace the lead 42. When the rotary disc member 60 is in the advanced position shown in FIG. 1, for example, the push ring 58 is separated from the rotary disc member 60 by a length required to chuck the lead, the push ring being so positioned by the spring 72 as best seen in FIGS. 1 and 3. On the other hand, when the rotary disc member 60 is in the retracted position (see FIG. 5) the push ring 58 is in engagement with the rotary disc member 60 under which condition the spread end portion 40 is out of engagement with recessed portion 36 of clamping ring 34. In this condition, it will be appreciated that the lead remains free from chucking and will not be extended even upon applying a gentle or strong pushing force on cap 54.

As best shown in FIG. 6, the slider 18 at its cylindrical portion is provided with a recess 76 adapted for engagement with the projection 26 on the outer periphery of the fastening base member 24 so that the slider 18 is retracted in accordance with upward movement of the base member 24, the slider 18 when located in the advanced position also being gradually retracted under writing pressure.

In the writing operation of the pencil according to the invention, lead of desired length (with the slider serving as a weight) may be advanced by applying a gentle pushing force on cap 54. When the pencil in the position shown in FIG. 1 is subjected to a gentle force (see FIG. 2) the slider 18 moves until it strikes the inner top of the cap nozzle, lead being extended in such event a length equal to the displacement distance of the clamping ring 34 along the fastening base member 24.

Accordingly, should the user desire to utilize the pencil for extended periods, the lead may repeatedly be extended by applying a gentle pushing force on cap 54. In that event, the push ring 58 will not engage nor move the rotary disc member 60 so that lead will be clutched in its advanced position upon release of pressure on cap 54 (see FIG. 1).

Upon termination of a writing operation, a strong force is applied to cap 54 (see FIG. 4) and the slider holding the lead advances under its weight or under the conjoint effect of disc member 60, pipe 28, base member 24 and projection 26, until it collides with the top of the cap nozzle. As is apparent from FIG. 4, the push ring 58, upon displacement thereof, by end cap 54 and casing 46 engages the rotary disc member 60 and urges the rotary disc beyond the protuberance 62 enabling the rotary disc to be turned by the push ring a predetermined angle so that upon release of pressure from end cap 54 (see FIG. 5), the rotary disc member is moved to the position shown in FIG. 5 under the influence of spring 68. The projection 26 on fastening base member 24 being in engagement with the slider 18 urges the slider to the position shown in FIG. 5 until the slider strikes the stop ring. The casing 46 is also retracted under the influence of springs 68 and 74 until the push ring 58 collides with the stepped portion provided at the end portion of the lower sleeve. With the parts shown in their FIG. 5 position, lead is not chucked and the lead will not be extruded even if the pencil is subjected to accidental pushing forces.

When the pencil in the state as best shown in FIG. 5 is subjected to a strong pushing force, the push ring 58 depresses the rotary disc member 60 whereby the fastening base member 24 with the pipe 28 is advanced whereupon the projection 26 of the fastening base member is disengaged from the engaging recess of the slider, permitting thereby advance of the slider as shown in FIG. 4. Upon release of the pushing force, the cap shown in FIG. 4 will move to its FIG. 1 position, and, because the disc member will have been urged a predetermined angle by push ring 58, the disc member will again abut the end protuberance so that the pencil is once again in writing position in the position as shown in FIG. 1.

It is a feature of the invention that lead of predetermined length together with the pipe may be extended by a strong pushing action on cap 54 and also in accordance with wear of the lead as it is consumed under writing pressure ensuring a continuous writing operation of extended period. When the lead in the tube 20 is entirely consumed, lead of desired length may be readily extended by applying a gentle pushing force on cap 54 while leaving the tube 20 in its advanced position and lead may be further extended by slow degree as desired by merely applying gentle pushing forces.

When in non-use or when carrying the pencil according to the invention, lead will not be extended even by application of strong forces so long as tube 20 is retracted in which case the lead end as well as the tube 20 are protected against breakage.

When going from the FIG. 5 to the FIG. 1 position, lead will not be extended at least until gentle pushing forces are applied to the cap 54 to an extent illustrated in FIG. 2 in relation to its FIG. 1 position.

Also, when tube **20** is retracted lead is not clutched and is therefore released so that the lead will not be subject to unrestrained forces.

While certain preferred embodiments of the invention have been illustrated by way of example in the drawings and particularly described, it will be understood that modifications may be made in the constructions and that the invention is no way limited to the embodiments shown.

I claim:

**1.** A pencil comprising a tubular elongated casing, relatively movable cooperating means within said casing for releasably clutching lead adapted to be fed from within said casing to a point outwardly at one end thereof, manually operable means at the opposite end of the casing, second cooperating means operatively connected with said manually operable means and with said relatively movable cooperating means for operating the latter under control of said manually operable means, a hollow cap nozzle at one end of the casing and terminating in an opening, a freely suspended hollow slider within said hollow cap nozzle, said slider having a first position contiguous to an internal end wall of the cap nozzle and a second position spaced from said end wall, a tubular member fixed at one end thereof to said slider for movement therewith and having an opposite end which projects through said opening in said cap nozzle when lead is clutched by said relatively movable cooperating means, and means providing guided movement of said slider when moving from its first position to its second position as an incidence of a writing operation.

**2.** A pencil according to claim **1**, wherein said relatively movable cooperating means comprise an annular stepped portion and a lead chucking member respectively carried by coaxially disposed tubes, said second cooperating means also being carried by said coaxially disposed tubes, a projection on that tube carrying said annular stepped portion and a recess in the slider adapted to receive said projection.

**3.** A pencil according to claim **2**, wherein said tubes are biased by spring means in a direction toward said opposite end of the pencil.

**4.** A pencil according to claim **3**, wherein second cooperating means comprise a push ring on one of the tubes and a rotary disc on the other of said tubes which surrounds said one tube, said one of the tubes being substantially longer than said other tube and terminating at said manually operable means, a first of said spring means surrounding said one tube and having its ends confined between two abutments one of which is carried by said one tube, said abutments being between said manually operable means and said push ring, a second of said spring means surrounding the other tube and having its ends confined between two further abutments one of which is carried by the other tube, said further abutments being between said rotary disc and said one end of the pencil above said slider.

**5.** A pencil according to claim **4**, wherein said push ring has a first and a second position in relation to said rotary disc with said manually operable means in its undisplaced normal position, said slider being in said first position thereof with said push ring in said first position and in said second position with the push ring in said second position thereof.

* * * * *