Feb. 1, 1955 A. T. LIGUORI ET AL 2,700,960

MECHANICAL PENCIL

Filed Feb. 21, 1951

Fig. 1.

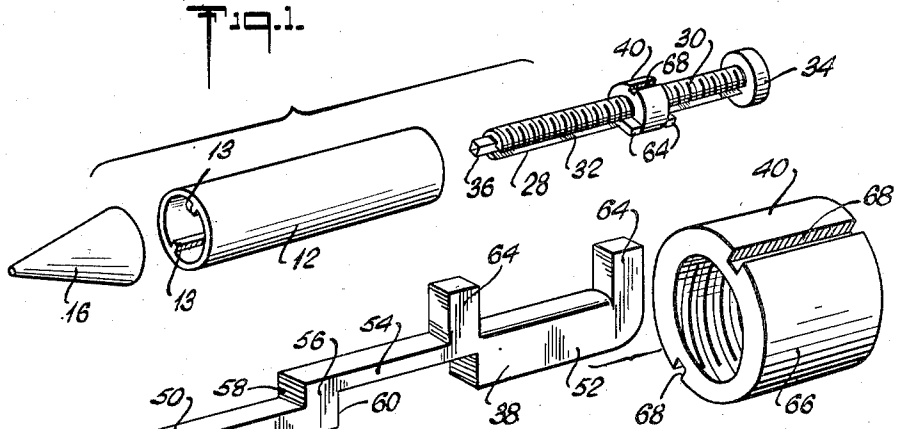


Fig. 2.

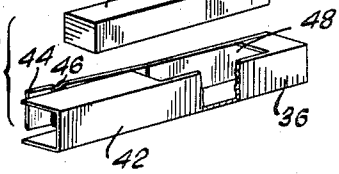


Fig. 4.

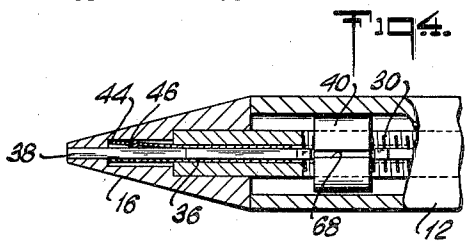


Fig. 3.

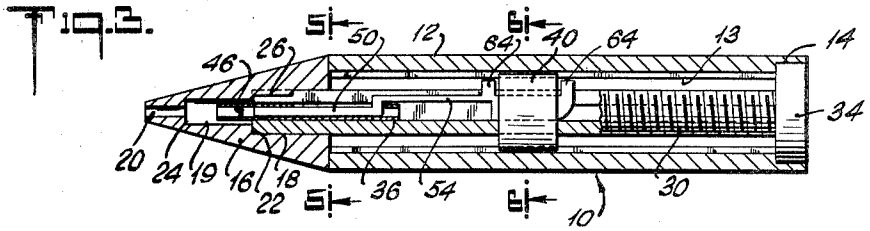


Fig. 5.

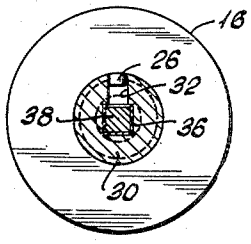
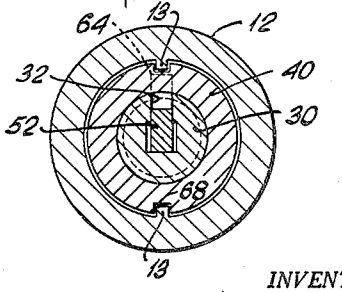


Fig. 6.



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MECHANICAL PENCIL

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Application February 21, 1951, Serial No. 212,046

5 Claims. (Cl. 120—18)

The present invention relates to improvements in mechanical pencils, and it relates more particularly to an improvement in lead ejecting mechanisms in mechanical pencils.

In mechanical pencils of the propel repel type, it is necessary, upon substantial depletion of a piece of lead, to eject the end thereof in order to insert a new piece of lead. There have been many mechanisms employed and proposed to effect the ejection of the lead end, but these have all been characterized by their complexity and their faulty operation. The ejection mechanisms generally employed include a tubular lead carrier or clutch and a cooperating ejector projecting into the tubular lead carrier. This carrier ejector assembly is slidably positioned in a longitudinally slotted guide, and means, usually including a helical track, are provided to advance and withdraw the carrier ejector assembly along the slotted guide. The carrier and ejector are each provided with a lug which engages the helical track and are advanced in unison along the slotted guide. Upon the carrier reaching its lower or advanced position, its lug disengages the helical track and its further advance is halted by a suitable stop. However, the ejector may be further advanced, extending through the tubular carrier and ejecting the lead carried thereby. By retracting the ejector, it is returned to its operable position relative to the carrier whereupon a new lead may be inserted. Upon further retraction, the carrier lug is engaged by the helical track and the carrier is retracted in unison with the ejector. The aforesaid ejecting mechanism is complicated, as is readily apparent, and is subject to jamming and other operating difficulties.

It is, therefore, a principal object of the present invention to provide an improved mechanical pencil of the propel repel type.

Another object of the present invention is to provide a mechanical pencil having an improved lead ejecting mechanism.

Still another object of the present invention is to provide a mechanical pencil of the propel repel type having an improved lead ejecting mechanism characterized by its simplicity, rugged construction and reliable operation.

The above and further objects of the present invention will become apparent from a reading of the following description taken in conjunction with the accompanying drawings wherein

Figure 1 is an exploded perspective view of the component parts forming a mechanical pencil embodying the present invention;

Figure 2 is an enlarged detailed perspective view of the component parts of the lead ejector mechanism, the detent finger of the lead carrier being illustrated for convenience and sprung from its normal position;

Figure 3 is a side longitudinal sectional view of the assembled pencil illustrating the lead ejecting mechanism position;

Figure 4 is a top longitudinal sectional view of the front end of the improved pencil with the lead ejecting mechanism in advanced position;

Figure 5 is a sectional view taken along line 5—5 of Figure 3; and

Figure 6 is a sectional view taken along line 6—6 of Figure 3.

The present invention in one of its broad aspects contemplates a lead ejecting mechanism including a sleeve-like lead carrier or clutch having a detent movable along a transverse axis of said sleeve and an ejector projecting into said carrier. The lead carrier and ejector are slidably positioned in a channel shaped groove formed in a guide member and the walls of the groove urge the carrier detent inwardly to a point which so interlocks the ejector and carrier as to restrict their relative movement. Where the carrier is advanced along the guide to a point where the wall disengages the carrier detent permitting its outward movement, means are provided to limit the further longitudinal propulsion of the carrier. However, the ejector may be further propelled and advanced relative the lead carrier, the detent being removed or urged from the path of the ejector and the lead carried by the carrier or clutch ejected therefrom.

Reference is now made to the drawings which illustrate a preferred embodiment thereof and wherein the numeral **10** generally designates the improved pencil which includes a tubular barrel **12** having formed in the inner face thereof a pair of radially opposed longitudinal ribs **13** of substantially transverse rectangular cross-section. The bore of the barrel **12** is enlarged at its rear end to provide an annular shoulder **14** spaced from the edge of the barrel **12**. Disposed at the front end of the barrel **12** and rotatably secured thereto, as will be hereinafter set forth, is a conical tip **16** coaxially arranged with respect to the barrel **12** and having three connecting coaxial bores **18**, **19** and **20** respectively formed therein, the bores being progressively smaller approaching the apex of the conical tip **16**. The bores **18** and **19** are connected by an annular shoulder **22**, and the bores **19** and **20** are connected by an annular shoulder **24**. Furthermore, a radially projecting rib **26** of rectangular transverse cross-section extends longitudinally along the inner face of the bore **18**.

There is provided a rod shaped guide member **28** having a thread **30** formed in its outer face which is here illustrated as a single thread but which may be a multiple thread. A longitudinally running axial groove **32** is formed in the guide member **28** and is substantially of rectangular cross-section having confronting side walls and a base. The groove **32** extends the full length of the guide member **28** and reaches a depth greater than the radius of the guide member **28**. Moreover, the walls defining the groove **32** end at their forward or leading portions in edges defining front termini. Rigidly fixed to one end of the guide member **28** is a circular cap **34** which nests into the enlarged end of the barrel **12** and has its lower face abutting the shoulder **14**. Furthermore, the front end of the guide member **28** fully and tightly registers with the bore **18** and the groove **32** engages the rib **26** formed in the inner face of the bore **18**. A suitable adhesive or other means may be employed to secure the assembly conical tip **16**, and the guide member and cap **28** and **34** or force fits may be effected where necessary. These parts may be formed of metal, organic plastics or any other suitable materials.

Considering now the lead transport and ejecting mechanism, there are provided a lead carrier or clutch **36**, an ejector bar **38** and an actuating nut or annulus **40**. The lead carrier **36**, which rides in the groove **32** in guide member **28**, comprises a sleeve **42** of substantially square transverse cross-section having a width about equal to the width of the groove **32**. The lead carrier **36**, guide member **28** and bores **19** and **20** are coaxially disposed. One of the side walls of the carrier **36** is defined by a movable or resilient flat arm or finger **44** which has an inwardly projecting rib or detent **46** formed rearwardly of the forward end thereof. The front end of the finger **44** may be urged away from the main body of the sleeve member **42** and is attached thereto at about the mid point thereof. It should be noted that the lead carrier is so disposed in the groove **32** that the finger **44** abuts or bears against a side wall of the groove **32**. Formed in the top wall of the lead carrier **36** is a rectangular aperture **48** extending from about the mid point of the sleeve member **42** to a point short of the rear end thereof.

The lead ejector bar **38** includes a front arm **50**, a rear arm **52** and an intermediate arm or bridge **54** joining the arms **50** and **52**. The arms **50** and **54** are vertically offset relative to each other and are connected by a leg member **56**, the front and rear walls of which define shoulders **58** and **60** respectively. The arm **50** nests in the sleeve member **42** and the leg **56** projects through the aperture

48. The arms 54 and 52 are disposed in the groove 32, extending rearwardly of the lead carrier 36 and not projecting above the upper edges of the groove. However, there are provided a pair of upstanding lugs disposed at each end of the arm 52 which project beyond the groove 32. It should be pointed out that the bottom face of arm 50 is preferably higher than the bottom face of arm 52 by the thickness of the lead carrier wall.

The actuating nut 40 comprises an internally threaded annulus 66 mounted on the guide member 28 and engaging the threads 30 thereof. The wall of the annulus 66 is disposed between the lugs 64 on the ejector bar 38 and is preferably of slightly less width than the distance between these lugs. Furthermore, a pair of radially opposed longitudinal grooves are formed in the outer peripheral face of the annulus 66 and engage the corresponding ribs 13 formed in the barrel 12. It should be noted that the lead carrier 36 and ejector bar 38 are preferably formed of suitable metals although any desirable material may be employed.

Considering now the operation of the improved mechanical pencil: upon rotation of the barrel 12 relative to the guide member 28 and conical tip 16, the nut 40 is retracted or advanced in accordance with the relative direction of rotation which in turn advances or retracts the ejector bar by bearing against the lugs 64. When the lead carrier 36 is within the groove 32, the finger 44 is in its normal closed position and the detent or rib 46 projects into the interior of the sleeve member 42. The forward motion of the ejector bar 38 relative to the lead carrier 36 is thus limited by the detent 46 and its relative rearward motion is limited by the rear edge of the aperture 48 bearing against the shoulder 60. Thus, the ejector bar and lead carrier are substantially interlocked, the carrier 36 being advanced and retracted in unison with the ejector bar 38 and propelling and repelling a piece of lead clutched in its forward end. As the lead carrier 36 is advanced to its forward position, it leaves the groove 32 and the finger 44 is disengaged by the respective side wall of the groove 32 as it is carried forward of the leading terminus of said side wall. Upon further advance of the lead carrier 36, its front end is brought to bear upon the shoulder 24 thereby limiting its further movement in that direction. However, the advance of the ejector bar 38 may be continued and the detent 46 urged from its path. The front edge of the ejector bar 38 bears against the cammed surface of the detent causing both the resilient finger 44 and the detent 46 to move outwardly. The advance of the ejector bar 50 is continued until its forward portion passes through the front end of the sleeve member 42 and through the bore 20 thereby ejecting any lead held by the carrier 36. The further advance of the ejector bar 38 is limited by the shoulder 58 bearing against the front edge of the aperture 48. In replacing the lead, the ejector bar is partially retracted, as aforesaid, the forward end of the carrier 36 being restricted from entering the groove 32 by the expanded finger 44 bearing against the forward edge of the groove 32. A lead is inserted in the carrier 36 through the bore 20 and the ejector bar 38 is further retracted. The ejector bar 50 having been removed from the path of the detent 46, the finger 44 and detent 46 return to their normal position thereby interlocking the lead carrier 36 and the ejector bar 38. The shoulder 60 then engages the rear edge of the aperture 48 and transports the carrier 36 into the groove 32. This interlocked condition is insured by the side wall of the groove 32 bearing against the finger 44. The lead may now be propelled and repelled as desired.

It is apparent from the above that we have provided a simple and rugged mechanical pencil provided with an improved lead ejector. The pencil is inexpensive to fabricate and simple to assemble.

While there has been described and illustrated a preferred embodiment of the present invention, it is obvious that numerous omissions and alterations may be made without departing from the spirit thereof.

Having now described our invention, what we claim and desire to secure by Letters Patent is:

1. In a mechanical pencil, a tubular lead carrier of substantially rectangular cross-section adapted to engage and releasably hold a piece of lead, the front portion of a side wall of said carrier being defined by a resilient longitudinal finger, a guide member having a longitudinal groove formed therein and a helical thread formed in its outer surface, said lead carrier being slidably disposed in said groove whereby said finger normally abuts a side wall of said groove, an ejector member projecting into said lead carrier and slidable along a path therein, said carrier having a longitudinal aperture formed in the top wall thereof, said ejector member having a portion thereof projecting through and slidable along said longitudinal aperture and being provided with a pair of longitudinally spaced lugs projecting above said groove in said guide, a nut engaging said helical thread and disposed between said lugs, means for rotating said nut relative to said guide member, and detent means disposed upon said finger and normally positioned in said path of said ejector member and being movable out of said path by said ejector member when said finger is disengaged from said groove wall and the forward motion of said lead carrier is restricted.

2. In a mechanical pencil, a guide member having walls defining a longitudinal groove, a first of said walls ending in a front terminus, a tubular lead carrier slidably disposed in said groove, an ejector member having a portion slidably disposed in said lead carrier and provided with a leading end movable to a point forward of the front end of said carrier, a detent positioned in said carrier and transversely movable into and out of the path of said ejector member, said detent being normally maintained in the path of said ejector by said first wall of said groove restricting the outward movement thereof and said carrier being movable to a point wherein said detent is disposed forward of said front terminus to permit the outward movement of said detent out of the path of said ejector, and means for limiting the forward movement of said carrier beyond a predetermined point.

3. A mechanical pencil in accordance with claim 1, wherein a resilient finger defines a portion of the wall of said lead carrier and supports said detent for transverse movement relative to the path of said ejector, said carrier being slidable between points in said groove wherein said finger is alternatively forward and rearward of said front terminus.

4. A mechanical pencil in accordance with claim 3, wherein said detent is defined by a ridge formed on the inner face of said finger, said ridge presenting rearwardly an inclined cam surface which is adapted to coact with the leading end of said ejector to urge said detent outwardly when said finger is forward of said front terminus.

5. A mechanical pencil in accordance with claim 2, including a conical tip mounted on the forward end of the guide member and having an axial bore formed therein substantially coaxial with said guide groove and of greater transverse cross-section than said guide groove.

References Cited in the file of this patent

UNITED STATES PATENTS

270,959	Lockwood	Jan. 23, 1883
296,538	Cross	Apr. 8, 1884
296,539	Cross	Apr. 8, 1884
338,611	Pusey	Mar. 23, 1886
349,914	Trebenschek	Sept. 28, 1886
561,734	Steele	June 9, 1896
1,142,794	Bergen	June 15, 1915
1,406,362	Fowler	Feb. 14, 1923
1,869,198	Keeran	July 26, 1932