Oct. 28, 1930. L. C. PIATT 1,779,854

MECHANICAL PENCIL

Original Filed May 21, 1926 2 Sheets-Sheet 1

Fig. 1.

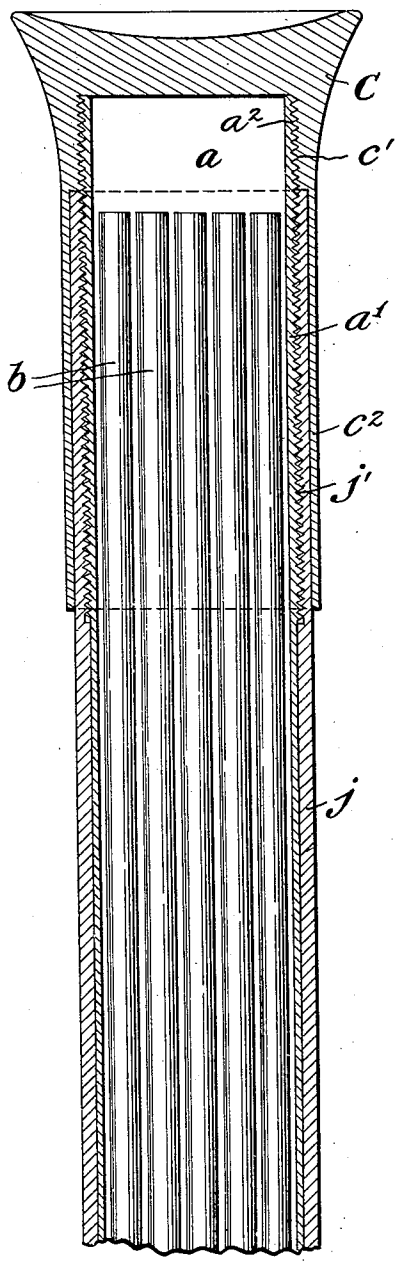
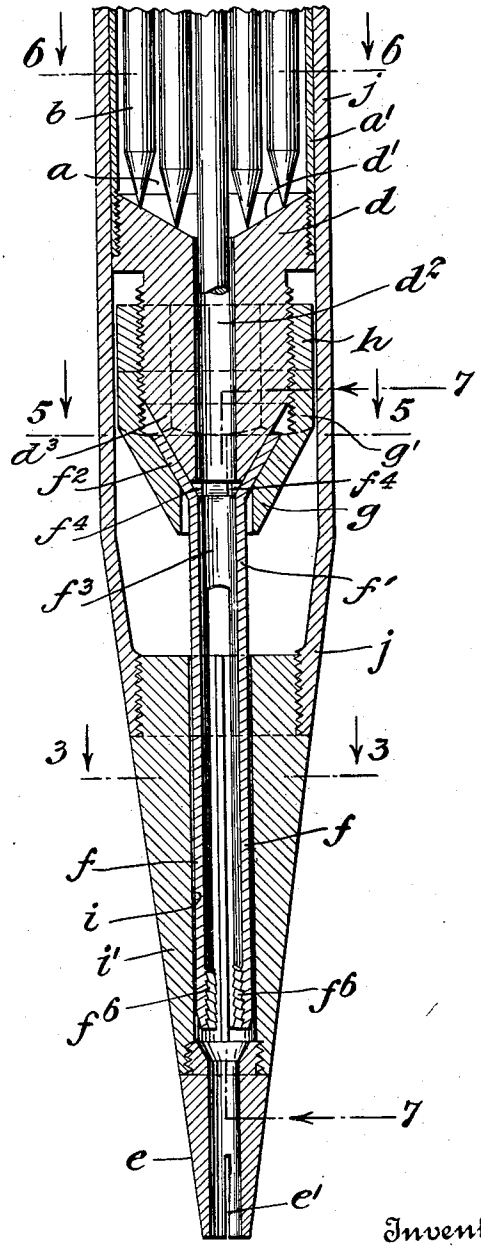


Fig. 2.



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Fig. 3.

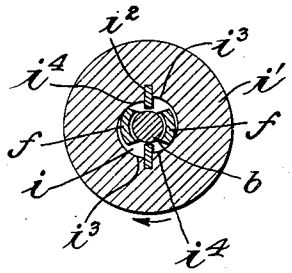


Fig. 4.

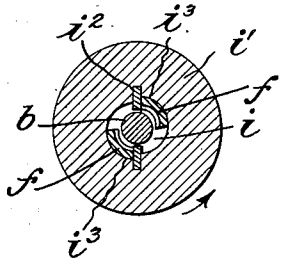


Fig. 5.

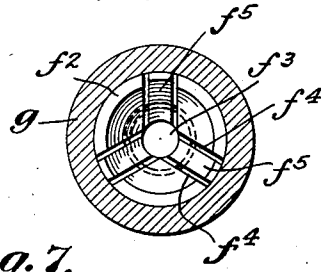


Fig. 6.

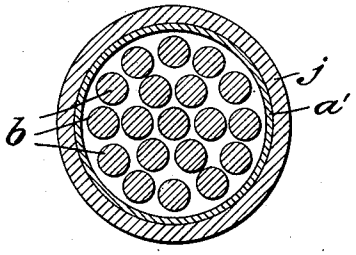


Fig. 7.

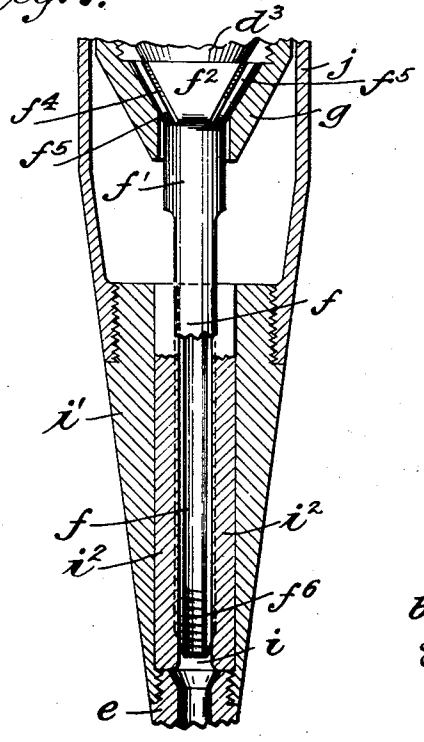
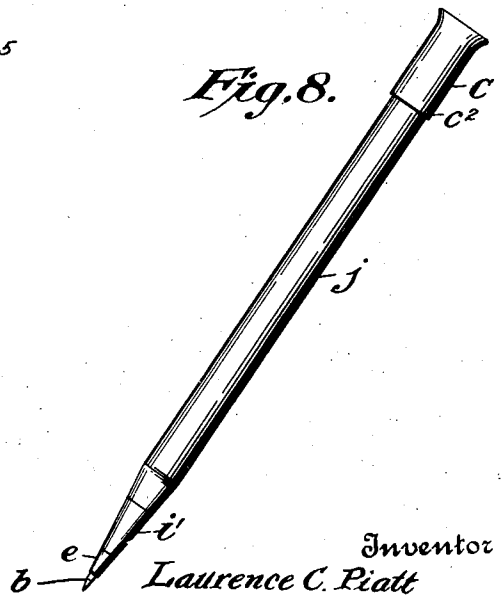


Fig. 8.



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UNITED STATES PATENT OFFICE

LAURENCE C. PIATT, OF BUFFALO, NEW YORK

MECHANICAL PENCIL

Application filed May 21, 1926, Serial No. 110,626. Renewed March 17, 1930.

This invention relates to a mechanical pencil in which the lead is propelled toward and expelled from the point at will, and has for one of its objects the provision of a pencil of large capacity for the reserve supply of leads. Heretofore, in many mechanical pencils, the lead has been moved through the instrumentality of a screw actuated pusher which has necessarily been so disposed in the body of the pencil as to decrease the space capable of devotion to a magazine. In accordance with the present invention such pushing mechanism is done away with and the major portion of the body of the pencil is available as a magazine for the leads. With pushing mechanism, it has been necessary, in most instances, to remove the lead, manually, from such magazine as the pencil might contain and insert it in a position to be acted upon by the pusher, or where manual loading has been obviated, the mechanical loading devices resorted to have had to be intricate and were easily disarranged. A further object of the present invention is to avoid these disadvantages by the provision of a simple and inexpensive instrumentality to feed a lead from the magazine and conduct it to the point. To this end a gravity feed for the lead is provided and the surface in the magazine upon which the leads rest is so formed as to permit only one lead at a time to leave the magazine under the action of gravity and commence its travel to the point. In the preferred embodiment the surface is given an inverted substantially conical form and the outlet is disposed at the axis and is of a diameter just sufficient to permit the passage of one lead.

Another aspect of the invention resides in the provision of instrumentalities adapted to propel and expel the lead so disposed within the pencil as to permit the incorporation of the foregoing advantageous features. Accordingly elements adapted for gripping a lead intermediate its ends are located adjacent the point of the pencil and these elements are caused to grip and release the lead by manually operable cam devices. More particularly the gripping mechanism comprises a plurality of members capable of rotation with the screw mechanism during the first part of its operation whereby the arms may be rotated into and out of contact with camming devices to effect their engagement and release from a lead and capable of relative movement with respect to the screw mechanism whereby a movement of translation of the lead is effected during subsequent movement of the screw mechanism.

These and other objects of the invention and the means for their attainment will be more apparent from the following detailed description of a preferred embodiment illustrated in the accompanying drawings, in which:

Figures 1 and 2 are transverse vertical sectional views showing, on an enlarged scale, the mechanical pencil according to the present invention and bringing out in particular detail the construction and configuration of the lead advancing and retracting mechanism and the manner to which a lead is conducted from the magazine to the clutching devices.

Figure 3 is a transverse sectional view taken in the plane indicated by the line 3—3 in Figure 2, looking in the direction of the arrows and showing the gripping or clutching elements in engagement with a lead through the instrumentality of cam surfaces.

Figure 4 is a view similar to Figure 3 but showing the gripping arms out of engagement with the lead and unaffected by the cam.

Figure 5 is a transverse sectional view taken in the plane indicated by the line 5—5 in Figure 2, looking in the direction of the arrows, and showing details of the assembly of the component parts.

Figure 6 is a sectional view taken in a

transverse plane indicated by the line 6—6 in Figure 2, looking in the direction of the arrows and showing the magazine full of leads and the outer casing forming part of the screw mechanism.

Figure 7 is a vertical sectional view similar to the lower part of Figure 2 but at right angles thereto, taken in the plane indicated by the line 7—7 in Figure 2 and looking in the direction of the arrows and showing particularly the threads on the gripping arms by which the lead is firmly retained therebetween.

Figure 8 is a view showing the pencil according to the present invention about natural size.

Most mechanical pencils heretofore provided have required the use of pushing mechanism within the body of the pencil to effect a movement of translation of the lead and their construction has generally been such as to necessitate the manual removal of a lead from a magazine and its insertion in operative relation to the pusher. Where the manual steps have been obviated, complicated and intricate mechanism has been resorted to which has taken up considerable room in the body of the pencil and reduced proportionately the space available for magazine purposes. In the pencil according to the present invention the major portion of the body of the pencil is available as a magazine space a for leads b which space is defined by a cylindrical magazine or container a' extending from a cap C to a guide d near the point of the pencil. By means of the guide a single lead at a time is permitted to leave the magazine and commence its travel to the tip e which is adapted to yieldingly engage the lead by being slotted as at e' instead of being rifled as in some pencils to contribute to the positioning of the lead as will be understood. The selection and exit of a single lead from the magazine may be accomplished on various ways but it has been found most convenient to have the leads in the magazine rest (assuming the pencil held in a vertical position) upon a substantially inverted conical surface d' so that the leads will tend to seek the lowermost portion thereof and the lead at the apex can pass out of the magazine by entering a passage d^2 leading to gripping devices which engage the lead from the side intermediate its ends and move it from or toward the point as desired. Figures 1 and 2 illustrate the disposition of the leads in the magazine with respect to the feeder or guide d it being understood, of course, that the leads have been indicated somewhat conventionally as being spaced. They may be in close contact in practice, of course.

The gripping devices are preferably formed as a pair of opposed resilient arms f, f defining a continuation of the passage d^2. Normally the resilient arms are so positioned that their inwardly serrated lead engaging ends f^6 are spaced from one another a distance equal to the diameter of the passage d^2 to afford unimpeded progress of the lead to the tip whereby it may protrude the desired distance therefrom in the first instance. To effect a movement of translation of the lead the serrated portions f^6 of the resilient arms are caused to grip the lead and then the arms themselves are given a movement of translation in the desired direction to effect either propulsion or retraction of the lead. This gripping action is preferably effected by cam surfaces forming the interior surface of a passage i in a tip member i' into which the tip e is threaded and which in turn is threaded into a cylindrical casing member j housing the magazine and guide member d. Referring to Figures 3 and 4 it will be seen that the diameter of the passage i varies between the diametrically disposed stops i^2 so that the interior of the passage at the points i^3 is sufficient to allow the prongs f, f to assume their normal position (see Fig. 4) to allow the unimpeded progress of the lead b therethrough. When, however, the casing (to which the member i' is rigidly secured) and the magazine a' (with which the gripping prongs f, f are carried) are rotated about their axes relative to one another, the portions i^4 of the passage i which are of reduced diameter are brought into contact with the arms f, f and cause them to move inwardly and grip the lead. In order, thereafter, to advance or retract the lead, the arms are given a longitudinal motion in the desired direction. It will be found necessary, therefore, to cause first a rotation of the arms to grip the lead, but this rotation can only continue until the arms abut against the stops. Thereafter, only longitudinal motion is possible obviously, whereas, as will be apparent hereinafter the movements of the lead gripping devices are effected by screw mechanism involving relative rotational movement between the magazine and the outside casing. In order then that the arms may be first given a rotational movement to bring them into or out of contact with the camming surfaces and thereafter only a longitudinal motion, a frictional clutching device, as it may be called, is interposed between the arms f and the guide member d by which they are carried. The arms, are formed, for convenience, upon a cylindrical carrier portion f' having a flaring or inverted conical top f^2 by which it is removably retained against an inverted conical surface d^3 on the guide member d by the inverted conical engaging portion g of a nut g' which is threaded sufficiently on to the threaded extremity d^3 of carrier d to retain the parts in engagement but yet afford a sliding fit between the flaring end f^2 and the associated parts. A lock nut h may also be

used to control the position of nut g and prevent its displacement. Thus when the magazine and guide d carried therewith are turned the frictional contact with the bifurcated member causes that member to turn with it bringing the arms into or out of engagement with the camming surfaces as the case may be. After the arms are in contact with the stops, for instance, further rotation of the magazine will cause the top f^2 to slide over the conical end of the carrier. As the rotation of the magazine is effected by screw mechanism its rotation causes a movement of the magazine longitudinally of the pencil, carrying with it the bifurcated member which slips over the guide and has only a longitudinal movement. To contribute to the frictional engagement of the flaring top f^2 advantage may be taken of the resiliency of the metal. To this end it may be slotted as at f^4, f^4 and the portions f^5 therebetween, which are disposed 120° apart, reduced in thickness to form resilient members to bear against the conical surface of the nut and give sufficient frictional engagement to cause the bifurcated member to turn with the magazine into and out of contact with the cam surfaces but permitting the flaring top to slip with respect to the guide when the arms contact with the stops.

The relative movement, both rotative and longitudinal, between what may be termed the magazine group of parts and what may be termed the casing group of parts is effected by screw mechanism located at the upper end of the pencil. The cap c is the key actuating element of the screw mechanism. It will be observed that this cap is inwardly threaded as at c' to engage with threads a^2 formed on the outside of the magazine a'. When the cap is screwed tightly onto the magazine a' rotation of the cap c will obviously cause the rotation with it of the magazine a'. The casing proper j extends within the cap at the portion of increased diameter c^2 and is inwardly threaded as at j' to mesh with the threads on the magazine a'. Thus when the cap is turned, the casing j being held stationary in the fingers, the magazine is caused to turn within the casing. Assuming now that the cap and magazine are screwed tightly together, a rotation of the casing group (relatively speaking) in a counterclockwise direction looking at Figure 4, with respect to the magazine group will cause the arms f to move against the stops i^2 at the parts of greatest diameter i^3. Holding the pencil in a substantially vertical direction a lead will now feed downwardly out of the magazine and may be permitted to protrude any desired degree beyond the point e. To hold the lead in that position the cap may be turned in the opposite position still holding the casing in the fingers which will cause rotation of the casing group in a clockwise direction with respect to the magazine group and bring the portion i^4 of reduced diameter in contact with the arms f to cause them to grip the lead b (see Figure 3). That degree of pressure incident to writing may now be brought to bear upon the lead without displacing it. When the lead wears further protrusion beyond the tip must be caused. This operation, called propulsion, is effected by turning the cap still further and causing further rotation of the magazine group. This further rotation of the magazine group causes a longitudinal movement thereof with respect to the casing group by reason of the interengagement of the threads and the arms f, f holding the lead therebetween are caused to move downwardly in the passage i and thus propel the lead through the tip. When the arms have reached the extreme outer or lower limit of their travel it is desirable to withdraw them and secure a fresh grip further up the lead. This is accomplished by turning the cap in the opposite direction effecting counterclockwise rotation of the casing group with respect to the magazine group which allows the arms to spring back to the position shown in Figure 4. Still further rotation of the cap will cause the combined rotative and longitudinal movement of the magazine along the threads on the casing j in an upward direction carrying the arms f upward in the passage i, the arms abutting against the stops i^2 turning with respect to the magazine group as a whole by reason of the loose or swivel connection between the nut g and the carrier f'. After the arms have been retracted a sufficient distance the cap is turned in the opposite direction to cause their engagement again with the lead as before.

The serrations inwardly on the extremities of the prongs f, f facilitate this gripping of the lead. In some situations relative movement of the arms f with respect to the lead in its initial or final stages may result in some abrasion of the surface of the lead. In order to obviate this or minimize its ill effects it is proposed to form the serrations as screw threads of the same pitch as the threads between the magazine and casing.

While no provision for an eraser has been illustrated it will be obvious that a place for one may be readily arranged in the cap.

By the construction described a mechanical pencil is afforded wherein practically the entire body is available as a magazine for a reserve supply of leads and the pencil is provided with automatic feeding means so arranged as to permit the leads to leave the magazine one at a time as a preceding lead is used up. The lead is propelled and expelled as desired by means of screw mechanism through the instrumentality of lead engaging elements which are disposed adjacent the tip in order to afford maximum space for a magazine.

Various modifications may be made in the configuration of the lead feeding devices and in the propulsion and expulsion devices as well as in the type of instrumentalities utilized to initiate their operation and their engagement with the leads and no limitation is intended by the phraseology or the disclosure of the foregoing specification except as indicated in the appended claims.

What I claim is:

1. In a mechanical pencil, in combination, a casing, a cap at the upper end of the casing, a magazine having an inverted conical bottom formed with an axial aperture for the passage of a lead to the tip and an inverted frusto-conical lower surface, a threaded connection between the magazine and the cap and casing, respectively, a lead gripping element formed with arms and having an inverted substantially conical face, means to support said face in frictional engagement with the lower surface on the magazine, and camming means disposed within the casing and with which the arms of the gripping element contact.

2. In a mechanical pencil, in combination, a casing, a cap at the upper end of the casing, a magazine having an inverted conical bottom formed with an axial aperture for the passage of a lead to the tip and an inverted conical lower surface, a threaded connection between the magazine and the cap and casing, respectively, a bifurcated lead gripping element having an inverted conical face, a nut to support said conical face in frictional engagement with the conical lower surface on the magazine, said casing being formed with cam surfaces with which the arms of the bifurcated member contact, and a stop for the bifurcated member.

3. In a mechanical pencil, a casing comprising a cylindrical portion, an end portion having an axial passage whereof the surface is formed with opposed cam faces and stops dividing said faces and a tip, a cap at the upper end of the casing, a cylindrical magazine, screw connections between the magazine and the cap and casing respectively, a magazine bottom element secured to the magazine and formed with an inverted conical upper surface and an axial aperture and an inverted conical bottom surface, a bifurcated gripping element having an inverted conical upper end and whereof the arms are disposed within the passage in the end portion of the casing, and a nut to support the end in frictional engagement with said bottom surface.

4. In a mechanical pencil, a casing comprising a cylindrical portion, an end portion having an axial passage whereof the surface is formed with opposed cam faces and stops dividing said faces and a tip, a cap at the upper end of the casing, a cylindrical magazine, screw connections between the magazine and the cap and casing respectively, a magazine bottom element secured to the magazine and formed with an inverted conical upper surface and an axial aperture and an inverted conical bottom surface, a bifurcated gripping element having an inverted conical upper end and whereof the arms are disposed within the passage in the end portion of the casing, a nut to support the end in frictional engagement with said bottom surface, said arms being formed with serrations inwardly of a pitch equal to the pitch of the screw connections.

5. In a mechanical pencil, in combination, a casing, a magazine having a bottom formed with an axial aperture for the passage of a lead to the tip and a lower friction surface thereon, a connection between the magazine and a lead engaging element, a lead gripping element, a friction surface on the upper portion thereof engaging the friction surface of the magazine, means to support said surfaces in frictional engagement with each other, and means to cause the gripping element to engage the lead.

6. In a mechanical pencil, in combination, a casing, a relatively rotatable magazine, a connection between the casing and magazine to cause the magazine to be moved axially upon relative rotation of the magazine and casing, a passage for a lead from the magazine to the tip, gripping elements for the lead carried within the casing, and clutching means between the magazine and gripping means mounted on the magazine and gripping elements for connecting the same together.

7. In a mechanical pencil, in combination, a casing, a magazine movable longitudinally with respect to the casing, a connection between the casing and magazine to cause the magazine to be moved axially upon relative rotation of the magazine and casing, a passage for a lead from the magazine to the tip, means within the casing to grip the lead, and clutching means between the magazine and gripping means mounted on the magazine and the gripping elements for connecting the same together.

8. In a mechanical pencil, in combination, a casing, a magazine, a connection between the casing and magazine to cause the magazine to be moved axially upon relative rotation of the magazine and casing, a passage for a lead from the magazine to the tip, gripping elements for the lead carried within the casing, and clutching means between the magazine and gripping means mounted on the lower end of the magazine and the gripping elements for connecting the same together.

9. In a mechanical pencil, in combination, a casing, means threaded thereon to engage a lead frictionally to prevent the lead from falling from the casing, means therein through which the lead is advanced to the means threaded on the casing, rotatable

means to grip the lead, and means to cause the gripping means to engage the lead in the rotation of such means in one direction to advance the lead and to disengage the lead in the rotation of the gripping means in the opposite direction at any position of the gripping means with respect to the casing.

This specification signed this 18th day of May, A. D. 1926.

LAURENCE C. PIATT.