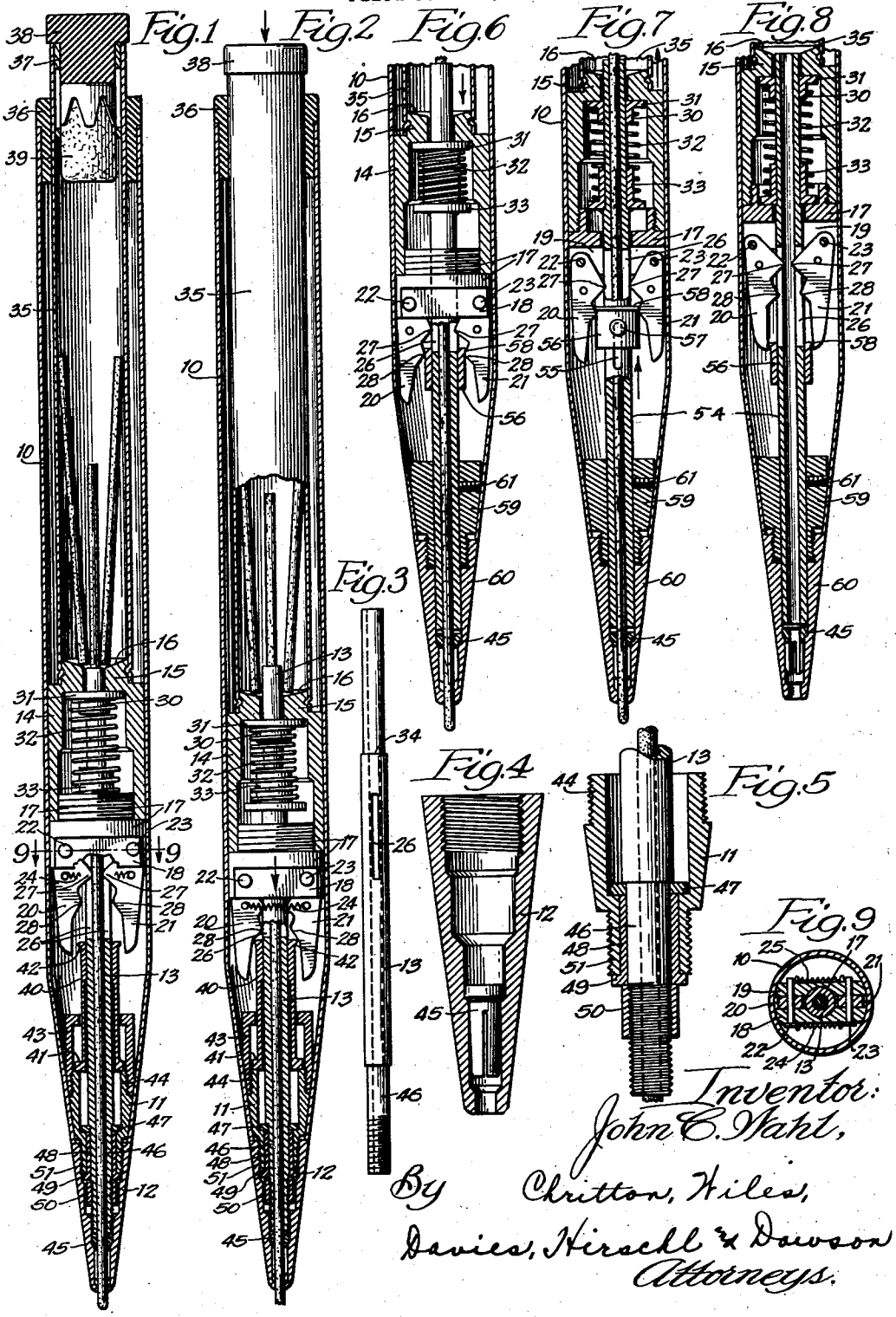
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PENCIL

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This invention relates to improvements in pencils and in particular to pencils of the so-called automatic type wherein the lead may be advanced with a step by step movement, being capable of operation with one hand only.

An object of my invention is to provide an improved pencil of the above type.

Another object is to provide improved means by which the lead may be grasped and fed forwardly.

A further object is to provide a pencil having improved means for holding the lead in position and which effectively resists any backward movement of the lead due to pressure applied to the lead when writing.

A further object is to provide an improved pencil in which the means for grasping the lead to advance it may be readily disengaged from the leads, as said means is returned to normal position.

An additional object is to provide a pencil in which the feed mechanism, although of the step by step type, may rotate within the barrrel so that although such rotation is not necessary in feeding the lead downwardly, nevertheless it results in no damage to the mechanism.

Other objects and advantages of my invention will appear as the description proceeds.

With reference to the figures, in which like numerals represent like parts:

Fig. 1 is a longitudinal, sectional view of the preferred embodiment of the invention, with the feed mechanism in retracted position;

Fig. 2 is a similar section, but with the feed mechanism in a different stage of its operation;

Fig. 3 is an elevation of the tube through which the pieces of lead are advanced;

Fig. 4 is an enlarged view of the tip of the pencil;

Fig. 5 is an enlarged view of the swivel support for said tube;

Fig. 6 is a fragmentary, sectional view of a modified form of feed mechanism, with the lead projecting from the end of the pencil the maximum amount;

Fig. 7 is a similar sectional view showing the feed mechanism in a different stage of its operation;

Fig. 8 is a similar view showing said feed mechanism in its normal position and with no lead in the tube; and

Fig. 9 is a section taken on the line 9—9 of Fig. 1.

With reference to Figs. 1 and 6, certain elements are the same in each embodiment and will be referred to by the same reference numeral. Reference numeral 10 refers to the barrel of the pencil which is in the form of a tubular shell with the lower end thereof tapering in the usual manner. A plug 11 is positioned at the lower end of the barrel 10 its walls being tapered also so that it may be firmly wedged in place, the plug having a downwardly extending screw threaded projection thereon which is received in a correspondingly threaded recess in the tip 12 so that the latter acts as a nut and aids in holding the parts together. A central tube 13, through which the leads are advanced, passes through the plug 11 and through a portion of the tip 12 and extends upwardly from the tip to a point about midway of the length of the barrel. This tube serves as the guiding means for the individual lengths of lead which are fed from the lead chamber to the point of the pencil. See particularly Fig. 3.

In order to advance the pieces of lead toward the point, the following mechanism is provided. A member in the form of a small housing 14 is positioned within the barrel and is adapted to slide back and forth therein, said housing being apertured to permit the fixed tube 13 to extend therethrough so that said housing may reciprocate with respect to said tube also. An extension 15, of reduced diameter, is provided at the upper end of said housing and tapers downwardly toward the central aperture, as indicated at 16.

A closure plug 17 is screw threaded into the lower end of said housing and also has a central aperture therethrough. In addition there are two depending ribs 18 and 19 which are spaced from each other in parallel relationship. Said ribs are adapted to receive between them the toggle members 20 and 21 which are mounted on suitable pivot pins 22 and 23 which may be riveted in place, each pin supporting one of the toggle members, of which there are preferably two. These two members serve also as a pair of tongs, as explained later. Springs 24 and 25 are provided on either face of the toggle members, each spring being secured at either end to each of the toggle members by a suitable pin to draw the same toward each other in a balanced arrangement. The tube 13 is provided with slots 26, corresponding in number to the number of toggle members, two in this instance, which are disposed opposite each other and through each of which slots projects a tooth or sharp point 27, formed on the corresponding toggle member. Each of the toggle members is formed with a second triangular projection 28 just below said tooth 27 and which extends inwardly

toward the other toggle member to a less extent than said tooth and which provides a double cam surface, the purpose of which will be presently explained.

Mounted on the tube 13 within the upper part of the housing 14 is a slidable sleeve 30, provided with a flange 31 against which bears the upper end of a coil spring 32 which is also positioned within the housing. A similar collar 33 rests on a shoulder 34 (see Fig. 3) on the tube 13 and is secured by soldering or by other conventional means, and provides a seat for the lower end of the spring. The position of the lower collar 33 with respect to the housing 14 is such that when the housing is held in its uppermost position by the helical spring, which is its normal position, as shown in Fig. 1, the collar is in the lower end of the housing, the plug 17 being recessed to accommodate said collar.

Suitably affixed to the upper portion of the housing 14, as for example by spinning it over the boss 16, is a plunger 35 in the form of a cylindrical container for the lead to be used. It is centrally positioned within the barrel 10 and extends upwardly beyond the same and through a ring or ferrule 36 which spaces the two and acts as a bearing for the slidable inner tube or container. Said inner tube is provided with a suitable friction sleeve 37 which is removable therefrom with the cap 38 and which may also have the usual eraser 39 associated therewith.

The lower ends of the toggle members or tongs 20, 21, normally overlie a slidable collar 40, which in Fig. 1 is shown in its lowermost position. This collar has an annular flange 41 at its lower end and is preferably flared somewhat at its upper end 42 or provided with a shallow annular groove just below said end, to provide an outwardly flaring surface. The lower part of said collar is confined within a thimble 43, the lower end of which is screw threaded over a screw threaded boss 44 at the upper end of the plug 11. (See Fig. 5.) The flange 41 normally rests on the upper end of said boss which limits the downward movement of the collar 40. The operation is as follows:

A number of lengths of lead having been stored in the magazine or lead chamber 35, by removing the cap 38, one of said leads will slide into the upper end of the tube 13 until it is obstructed by two points or teeth 27 which are normally spaced apart a little less than the thickness of a lead, being yieldingly held in place by the two small springs 24 and 25. If the operator now presses on the cap 38 and depresses the plunger 35, the barrel 14 as a whole is moved downwardly against the resistance of the helical spring 32, the lower end of which is held against movement by its seat 33 which rests on the shoulder 34 on the small tube 13 through which the lead is guided to the tip or point. During this downward movement the cam surfaces 28 on the toggle members 20, 21, engage the upper end 42 of the collar and spread said members apart slightly, sufficiently to move the teeth 27 apart and permit the lead to fall to the tip of the pencil, in which it is restrained by a friction device 45 comprising a tubular member with slots, providing converging spring fingers which apply a slight friction to the lead, enough to hold it in place except when it is forced through said device.

Assuming that the single piece of lead in the tube is long enough to extend from the tip upwardly beyond the toggle members, the next step is to relax the pressure on the plunger, whereupon the helical spring 32 moves the housing 14 upwardly to its initial position, thus drawing the toggle members upwardly into position to grip the lead. At the end of the preceding downward movement, the two triangular projections 28 have been forced apart until they have snapped over and a little under the enlargement 42 at the upper end of the collar 40. In this position the toggle members serve as a pair of tongs and grip said collar, and during their upward movement they slide said collar upwardly until the flange 41 of the lower end thereof engages the upper end of the thimble 43, preventing further upward movement of said collar. Thereupon the triangular projections 28 ride off the enlargement 42, as the tongs continue their upward movement and said tongs are drawn together by the small helical springs, causing the oppositely facing teeth 27 to bite into opposite sides of the lead. In this position the lower ends of the tongs clear the upper end of the collar 40, as shown in Fig. 2.

The plunger is then depressed again whereupon the downward movement of the toggle members forces the lead past the friction device and out through the tip of the pencil. During this downward or forward movement of the lead, the grip thereon is provided by a toggle action, as a result of which any resistance which is encountered causes an increased grip on the lead and prevents slipping. Also, if the pencil is pressed down on a writing pad as in writing or otherwise, the upward thrust on the lead is resisted by said toggle members. It is apparent that successive depressions of the plunger will result in the advance of the lead with a step by step movement, the extent of which is determined, in general, by the length of the collar 40 and the length of the lower ends of the tongs. As soon as the upper end of the lead being used, descends below the top of the tube 13, another lead drops into place behind it and thus the various lengths of lead in the magazine are automatically fed through the pencil one after the other in alignment. During the period that the barrel 14 is depressed, it is positioned so that the boss 15 at its upper end is lower than the upper end of the tube 13 and the remaining leads in the magazine cannot drop into said tube, even if there is no lead projecting from the upper end thereof. It is understood, of course, that during the feeding operation the pencil is held preferably in vertical position or nearly vertically although the feeding operation after one of the leads has once been gripped, may take place with the pencil held in almost any position.

It will be seen that the collar 40 constitutes a stop member for spreading the toggle arms apart so as to release the lead gripped between them and also constitutes means for automatically holding them apart during their upward movement so that they will grip the lead at a higher point than the point of release. It will also be seen that when the collar 40 reaches the upper limit of its movement, and the opposing cam members 28 are drawn off the upper end of said collar, the latter is restored to its initial position with a snap action, due to the fact that the opposing cam surfaces are drawn toward each other suddenly by the small helical springs as soon as they are released. In addition said collar tends to fall by its own weight. The enlargement 42 at the upper end of said collar insures a little firmer grip between the tongs and said enlargement, although the latter may be omitted as said collar will be drawn upwardly by the frictional grip thereon without the pro-

vision of a groove or outwardly flaring enlargement.

Since many mechanical pencils on the market are operated by rotating or screwing the upper end thereof with respect to the lower part, the users of such pencils are inclined to attempt to rotate some part of a pencil such as the one shown herein, in which the lead is advanced with a step by step movement and not with a rotary movement. To prevent damaging the mechanism by the application of force in an attempt to rotate the end, the pencil shown herein is so constructed that the step by step feed mechanism rotates freely within the outer barrel, even though such rotation performs no function.

The swivel supporting means will now be described which permits such rotation. These parts are shown on a larger scale in Figs. 4 and 5. The lower part of the tube 13 is reduced in diameter somewhat, as shown at 46, thereby providing a shoulder, as shown in Fig. 3, the lower end of said reduced portion being screw threaded. A washer 47 is seated against said shoulder, as shown at Fig. 5, and a sleeve 48 is pressed upwardly against said washer, said sleeve having a flange 49 at the lower end against which is screwed a nut 50. Thus a collar is applied to the lower end of said tube, which collar has a flange at the upper and lower end thereof which serve as stop flanges to prevent upward and downward movement of the tube but permit the same, and the collar affixed thereto, to rotate freely in the lower screw threaded extension 51 on the plug 11 which serves as a bearing and to which is screwed the tip 12, as previously stated. The bore of said tip is sufficiently large to permit the lower end of the tube 13 to rotate therein without interference.

With this arrangement, if the user of the pencil attempts to twist the cap while depressing the plunger, practically the entire mechanism above the tip and the plug will rotate and the lead will be advanced, due to the inward movement of the plunger, without reference to whether the same is rotating at the same time that it is reciprocated. Also, it will be noted that the pencil may be operated with one hand, i. e. the barrel may be grasped by the fingers and the cap depressed with the thumb, whereas with a rotatable type of mechanism for advancing the lead, two hands are required to operate the same.

In assembling the pencil, the lead chamber or plunger with the housing 14, the toggle members below the same and the small tube 13 with the collar, thimble and plug thereon, are inserted into the large end of the barrel until the plug projects from the lower end thereof, after which the nut is screwed over the lower end of the plug and tightened.

In the modification shown in Figs. 6, 7 and 8, the tube 54 is provided with a longitudinal slot 55 and with a slidable sleeve 56 which carries a set screw or stop screw 57 which extends into said slot and serves to limit the up and down movement of said sleeve. The screw is short and does not contact with the lead. This sleeve may be provided with a groove or with a bead 58 at the upper end and it operates in a manner very similar to the slidable collar 40, shown in Figs. 1 and 2.

Several different positions of the feed mechanism are shown in these figures. For example, when the cap at the upper end is depressed, the housing 14 is moved downwardly to advance the lead to about the position shown in Fig. 6 which shows said toggle members after they have been spread apart to release the lead and just before the pressure on the helical spring 32 is released. In this figure the sleeve 56 is in lowermost position with the set screw or stop 57 at the bottom of the slot 55. As the housing 14 moves upwardly, the stop screw strikes the upper end of said slot, shown in Fig. 7, limiting the upward movement of said sleeve, after which said housing continues its upward movement to the position shown in Fig. 8 which is reached after the opposing cam projections have ridden off the upper end of said sleeve and snapped the latter to its lowermost position, shown in said figure. In this Fig. 8, however, no lead is shown, so as to indicate the position of the toggle arms or tongs when they are drawn together as far as possible. In this position the lower ends of the tongs are obstructed against further inward movement by the upper end of the sleeve 56.

In this second embodiment of the invention, the lower end of the tube 13 is held in fixed relation to the plug 59, and the tip 60 screwed thereto, by means of a very small set screw 61. However, if it is desired to permit the feed mechanism to rotate within the barrel, said set screw may be omitted and the tube 13 made of such diameter as to have a sliding fit in the bore in the tip and the plug.

Although I have described two modifications of my invention, it will be understood that various other modifications and changes in the construction and in the proportion, shape and size of the various parts thereof may be effected, without departing from the spirit of my invention as defined in the following claims.

I claim:

1. An automatic pencil comprising a barrel with a channel extending therethrough, means for advancing the lead through said channel comprising reciprocable toggle members disposed on either side of said channel for gripping the lead, resilient means to hold said toggle members in gripping position, means for reciprocating said toggle members with respect to the barrel, means for spreading said toggle members to disengage said lead when said toggle members have advanced said lead a predetermined distance, and means for holding said toggle members in disengaged position during the reverse movement thereof.

2. A pencil having a longitudinal tube in which the lengths of lead are supported in alignment, a casing surrounding the same, said tube having slots on opposite sides thereof, a frame slidable longitudinally with respect to said tube, a pair of toggle members pivoted to said frame and having portions projecting into said slots to engage the lead, means for moving said frame and hence said toggle members to advance said lead and a sleeve on said tube in advance of said toggle members to be engaged thereby and release said lead.

3. A pencil having a longitudinal tube in which the lengths of lead are supported in alignment, a casing surrounding the same, said tube having slots on opposite sides thereof, a frame slidable longitudinally with respect to said tube, a pair of toggle members pivoted to said frame and having portions projecting into said slots to engage the lead, means for moving said frame and hence said toggle members to advance said lead, a sleeve on said tube in advance of said toggle

members to be engaged thereby and release said lead and a spring arranged to be compressed when said frame and said lead are advanced and serving to restore said frame to initial position after said lead is released.

4. A pencil having a longitudinal tube in which the lengths of lead are supported in alignment, a casing surrounding the same, said tube having slots on opposite sides thereof, a frame slidable longitudinally with respect to said tube, a pair of toggle members pivoted to said frame and having portions projecting into said slots to engage the lead, means for moving said frame and hence said toggle members to advance said lead, a sleeve slidable on said tube and positioned in advance of said frame, said toggle members having cam surfaces thereon to engage said sleeve and spread said toggle members apart to release said lead after said frame has been advanced a predetermined distance, a spring compressed by the forward movement of said frame and serving to return the same to initial position after said lead is released, said toggle members having portions thereon which frictionally engage said sleeve and withdraw it during the return movement of said frame, and means for arresting the return movement of said sleeve before said frame has reached its initial position, whereby said toggle member portions are withdrawn from said sleeve during the remaining movement of said frame and reengage the lead to advance it during the next operation.

5. A pencil comprising an outer barrel and an inner barrel, said inner barrel extending concentrically with and for a portion of the length of said outer barrel, a channel for the reception of lead extending through said outer barrel into communication with said inner barrel, the lower surface of said inner barrel being of conical shape whereby lead disposed within said inner barrel may readily drop into said channel, toggle members associated with said inner barrel for gripping and advancing the lead through said channel, and means for preventing lead disposed in said barrel from entering said channel during such time as said inner barrel is depressed for advancing the lead already in said channel.

6. In a pencil, an outer casing, a step by step feed mechanism therein, a central tube through which the pieces of lead are advanced, a tapering plug at the outer end of said pencil having a bore and a sleeve secured to said tube and rotatable in said bore.

7. In a pencil, an outer casing, a step by step feed mechanism therein, a central tube through which the pieces of lead are advanced, a tapering plug at the outer end of said pencil having a bore, a sleeve secured to said tube and rotatable in said bore, said sleeve having a flange thereon to engage a transverse wall of said plug and prevent longitudinal movement of said tube and a tip secured to said plug having a bore in which the lower end of said tube is rotatable.

8. In a pencil, an outer casing, a step by step feed mechanism therein, a central tube through which the pieces of lead are advanced, a tapering plug at the outer end of said pencil having a bore, a sleeve secured to said tube and rotatable in said bore, a collar having a lateral projection thereon and slidably mounted on said tube between said feed mechanism and said plug, and a thimble on said plug within which said projection is located, to limit the up and down movement of said collar, the latter comprising part of said feed mechanism and serving to limit the movement thereof.

9. In a pencil having a spring pressed plunger and a pair of toggle members connected thereto to grip and advance the lead, a pair of helical springs secured to said toggle members to draw them toward each other and means for separating said toggle members after a predetermined feeding movement.

10. In a pencil having a spring pressed plunger and a housing secured thereto, with depending supports thereon, a pair of toggle arms pivoted to said supports, and springs normally drawing said toggle arms toward each other.

11. In a pencil having a spring pressed plunger, a housing secured thereto having a central bore, and a fixed tube over which said housing slides, a seat secured to said tube within said housing, a helical spring surrounding said tube, supported on said seat, and normally biasing said housing and plunger upwardly, and toggle members depending from said housing.

12. In a pencil having a spring pressed plunger, a housing secured thereto having a central bore, and a fixed tube over which said housing slides, a seat secured to said tube within said housing, a helical spring surrounding said tube, supported on said seat, and normally biasing said housing and plunger upwardly, toggle members depending from said housing, said toggle members each having a tooth thereon to grip the lead and a cam surface below said tooth, said tube being open adjacent said teeth to permit the same to grip a length of lead therein, and means to be engaged by said cam to separate said teeth.

13. A pencil having a casing open at the lower end, mechanism comprising an operating unit for propelling lead with a step by step movement, said unit including at one end a swivelly connected plug, and means to secure said plug to the lower end of said casing.

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