





# UNITED STATES PATENT OFFICE

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## LEAD PENCIL

Application filed August 18, 1922. Serial No. 582,800.

This invention relates to lead pencils.

One object of this invention is to provide a pencil in which the lead automatically feeds outward.

Another object is to provide a pencil in which the feeding of the lead is effected by the action of writing.

Other objects will be apparent from the following description, taken in connection with the accompanying drawing, wherein

Fig. 1 represents a longitudinal sectional view of a pencil embodying my invention.

Fig. 2 is an enlarged sectional view of Fig. 1, taken on line 2—2.

Fig. 3 is a detail view of the casing.

Fig. 4 is a fragmentary view of the end of the tube.

Fig. 5 is an end view of the tube shown in Fig. 4.

Fig. 6 is an enlarged elevation of the upper portion of the piston 6 of Fig. 1.

Fig. 7 is a plan view of the part shown in Fig. 6.

Fig. 8 is a longitudinal sectional view of a modified form of my invention.

Fig. 9 is a sectional view taken on the line 9—9 of Fig. 8.

In the drawing, 9 is a tubular casing forming a handle or body for the pencil. 4 is a lead carrying tube which is free to slide in bushings 10 and 11, fitted in the casing 9. The upper end of the tube 4 is enlarged, as shown at 4<sup>a</sup>, to receive the prongs 12 of an inner casing 3. The prongs 12 normally expand as shown in Fig. 3, and the outwardly turned ends 14 are arranged to engage the groove 15 formed in the enlarged end 4<sup>a</sup>; therefore lengthwise movement of the casing 3 will carry with it the tube 4, or vice versa.

Fitted free to slide in the casing 3 is a piston 6 which carries the push rod 16; the push rod is adapted to slide in the tube 4 and forms a backing for the lead 17. The piston 6 is provided with three channels 18 (Fig. 7) adapted to receive the prongs 12. The piston 6 and casing 3 are guided in their lengthwise movement by a guide tube 19 and are rotatable therein for a purpose to be later set forth. The tube 19 is corrugated longitudinally to form inner arc

shaped guide walls 28 for the piston 6 and casing 3 and outer arc shaped walls 39 which fit the inner wall of the body 9, being sweated therein to secure the tube 19 against movement in the body 9.

The piston 6 is further provided with grooves 20 and 21 to carry the balls 25 and 26 respectively and also the springs 22. The casing 23 forms part of the piston 6 and is provided with holes 24 through which the balls 25 and 26 protrude. Through the particular arrangement of these balls, springs, grooves and casings as shown, they form what is well known as a oneway clutch. The tube 4 and casing 3 are free to be moved lengthwise in either direction, and preferably should be free enough to gravitate at least in the forward direction when the casing 9 is held stationary. It should also be observed that due to the normal action of the oneway clutch formed by the balls 25, the piston 6 is free to be moved in the forward direction relative to the casing 3 but not in the reverse direction.

The feeding operation of this pencil is as follows:—Throughout the customary actions of writing the end 30 of the tube 4 will normally be in contact with the writing surface. The pressure on the end 29 of the lead is transmitted from the writer's hand through the casing 9, guide tube 19, balls 26, piston 6, push rod 16 and lead 17. As writing is in progress and the end 29 of the lead wears away, the pressure transmitting elements above recited, gradually move downward, or forward relative to the casing 3, as indicated by arrow 27, while the tube 4 rides upon the writing surface. Now after the piston 6 has moved forward relative to the casing 3, the balls 25 grip at a new forward point upon the inner surface of the prongs 12 of the casing 3. As a result of this forward movement the shoulder 38 and bushing 11 have separated. Now while the pencil is being raised from the writing surface, that is between the making of words or characters, the end 30 of tube 4 normally remains in contact with the writing surface until the shoulder 38 again contacts with the bushing 11. This action is caused by the action of



gravity in holding the tube 4 and casing 3 down while the casing 9 and guide tube 19 are being raised, and in addition the action of gravity also holds the piston 6 with its component parts against raising until the shoulder 38 contacts with the bushing 11; and providing the piston 6 and its component parts are of sufficient weight to overcome what slight efforts needed to release the locking action of the balls 26, the balls 25 will not be needed. However to insure that the piston 6 will remain stationary with the casing 3 during the raising of the pencil from the writing surface, I prefer to employ the balls 25 or a oneway clutch of the character formed thereby. For this pencil to be self feeding it is of course essential that the combined weight of the casing 3, tube 4, piston 6 and its component parts, be of sufficient weight to release the locking action of the balls 26, otherwise sufficient weight will have to be provided. I have therefore arranged for a weight in the form of a plug 48 which may be made of more or less volume or of a suitable heavy metal.

When the inner mechanism remains stationary while the casing 9 and guide tube 19 are being raised, the balls 26 will then grip at a new point on the inner surface of the guide tube 19, and lock the piston against inward movement at this new point. Accordingly the lead has in effect moved outward, or in other words forward relative to the casing 9, and is held firmly against inward movement at this new forward point. The above described actions are of course generally repeated during the making of each word or character, and we have in effect a substantially constant feeding action for the lead as the end thereof wears away.

The forward movement of piston 6 is limited by the shoulder 34 when it contacts with the tube 4 in the conical bore 35, and the distance from the lower edge of the piston 6, when in this down position as shown in light broken lines, to the lower end of the prongs 12, must be sufficient to permit the prong ends 14 to spring inward and release from the groove 15 when the casing 3 is pulled from the casing 9 in the direction indicated by arrow 37.

To refill this pencil, the casing 3 and piston 6 are rotated a slight distance in either direction, indicated by arrow 36 (see Fig. 2); this brings the balls 26 and prongs 12 opposite the walls 39 of the tube 19 so that the piston 6 is now free to move in either direction longitudinally relative to the casing 9. The casing 3 with the piston 6 and the push rod 16 may now be withdrawn from the casing 9 by pulling in the direction indicated by the arrow 37. A new lead may now be inserted in the tube 4.

To reassemble the pencil the piston 6 is first positioned in the casing 3 as shown in light broken lines in Fig. 3; the prongs 12

are then pressed together and inserted in the guide tube 19, and finally the casing 3 is moved forward until the ends 14 snap into the groove 15. During this operation the balls 26 may or may not be in contact with the walls 28 of the guide tube 19, because these balls do not prevent movement of the piston 6 in the direction indicated by arrow 27 but only in the opposite direction; however before the pencil is ready for service it is necessary to turn the casing 3 in either direction indicated by arrow 36 until the balls 26 are in contact with the walls 28. The tube 4 with the casing 3 should then be reciprocated until the end 29 of the lead is flush with the end 30 of the tube. The pencil is then ready for writing.

To prevent the lead 17 from inadvertently falling out of the tube 4, the end of said tube is split as shown at 40; the prongs 41 formed thereby are bent slightly inward which produces a slight gripping action on the lead, however this gripping action must be very slight so as not to interfere with easy lengthwise movement of the tube 4, but it must also be sufficient to prevent the piston 6 and its component parts from moving inadvertently in the forward direction. The prongs 41 are enveloped in a casing 42 to give a smooth end at 30.

With reference to Figs. 8 and 9 which represent a modified form of my invention, 9 is a tubular casing which carries free to slide lengthwise the lead carrying tube 4. Slots 43 are provided to permit engagement of the spring pawls 44 and 45 with the push rod 16.

The pawls 45 are carried by the casing 9, and the pawls 44 by the tube 4. Push rod 16 of Fig. 8 is provided with teeth 46 to facilitate the gripping action of the pawls; these teeth however should be very fine.

In either of the forms shown in the drawing it is very apparent that the tube 4 is free to recede on the lead 17, while the push rod 16 forms a backing for the lead. In the modified form Fig. 8, the pawls 45 may be fairly stiff, but the pawls 44 should be delicate as their only function is to force the push rod 16 forward between the pawls 45 when the tube 4 is moved forward. The effort necessary to overcome the resistance set up by the pawls 45 to forward movement of the push rod 16 is very slight, therefore delicately formed pawls 44 will not have any perceptible effect on reverse movement of the tube 4 when receding on the lead 17.

Of course in this modified form, if a self feeding pencil is desired, it is essential that the tube 4 and its component parts have sufficient weight to gravitate forward when the casing 9 is held stationary, and at the same time carry with it the lead 17 and push rod 16 through the pawls 45.

However this pencil is not entirely inoper-



ative or devoid of usefulness if the tube 4 is not arranged to gravitate in the forward direction. The tube 4 may be free to be moved lengthwise but not free enough to gravitate in either direction, in which case it is only necessary to press on the end 32 of the eraser 33 occasionally, and in this manner normally keep the shoulder 38 against the bushing 11, and thereby keep the pencil in condition for writing.

In connection with this self feeding feature, reference is here made to my copending application on lead pencil, filed January 5, 1922, bearing Serial No. 527,169.

It is further noted that it is not essential that the oneway clutch formed by the balls 25 need to be absolutely locking in the reverse direction; that is to say, it might be free enough to be moved in the reverse direction without destroying the usefulness of this pencil. It is however essential that the oneway clutch has sufficient gripping action to carry the piston 6 in the forward direction with forward movement of the casing 3, and free enough in the opposite direction to permit the tube 4 to recede upon the lead when under the influence of normal writing pressure. Any arrangement which carries out this function should be considered an equivalent of this oneway clutch. As an example, the pawls 44 in Fig. 8 might be eliminated, and the normal friction between the push rod 16 and the tube 4 will normally suffice to carry the push rod 16 forward with forward movement of the tube 4 and through the pawls 45, especially would this occur if the push rod was slightly bent. However I prefer to employ the pawls 44 to insure proper action.

It is obvious that a spring might be incorporated in this pencil and arranged to normally hold the tube 4 in the forward position, similar to that shown and described in my copending application above referred to. However when a spring is arranged in such manner it is necessary that sufficient pressure must be applied to the pencil while writing to overcome the energy stored in this spring, which pressure is additional to that required for merely producing the writing. In my present invention it is an object to eliminate the need of this additional pressure, and I accomplish this by substituting a weight for the spring.

Reference is here made to my copending applications on lead pencil, Serial No. 576,011, filed July 19, 1922; and Serial No. 483,738, filed July 11, 1921.

Having thus described my invention, what I claim, and desire to secure by United States Letters Patent is as follows:

1. A lead pencil comprising a casing and a lead-carrying tube mounted in said casing, said tube being arranged to freely gravitate together with the lead between limits relative to said casing and recede relative to the

lead when under the influence of normal writing pressure.

2. A lead pencil comprising a casing, a lead-carrying tube mounted in said casing, said tube being arranged to freely gravitate together with the lead in the forward direction relative to said casing and recede when under the influence of normal writing pressure, means for limiting the forward movement of said tube, and means capable of holding the lead against inward movement while said tube recedes.

3. In a lead pencil the combination of a casing, a lead carrying tube mounted in the casing so as to be free to gravitate between limits, means which holds the lead against inward movement relative to said tube, and means which holds the lead against inward movement relative to said casing.

4. A lead pencil comprising a casing, a lead-carrying tube slidable endwise in said casing and extending beyond one end thereof and arranged to slidably support a lead, said tube being arranged to freely gravitate between limits in the forward direction relative to said casing and recede when under the influence of normal writing pressure, and means for holding the lead stationary during receding movement of said tube, said means being capable of carrying the lead forward with the tube in its forward movement.

5. A lead pencil as claimed in claim 1 in which the tube is provided with a weight to cause it to gravitate lengthwise relative to said casing.

6. The combination with a pencil casing, of a slidable tube in said casing capable of carrying a lead and arranged to recede relative to the lead when under the influence of normal writing pressure and freely gravitate in the forward direction, means, including a device arranged to engage the lead, for holding it against inward movement during receding movement of said tube, and means for locking said device and said tube together during outward movement of the latter.

7. The combination with a pencil casing, of a slidable tube in said casing capable of carrying a lead and arranged to recede when under the influence of normal writing pressure, means, including a device arranged to engage the lead, for holding it against inward movement during receding movement of said tube, and means for locking said device and tube together during outward movement of the latter, one of said means comprising one way clutch.

8. In a lead pencil, the combination of a casing, a lead carrying tube slidably mounted in said casing and extending beyond one end thereof for engagement with the writing surface during writing and free to gravitate in the forward direction and recede relative to the lead when under the influence of normal writing pressure, a rod for engaging the lead



in said tube, means for holding said rod against inward movement relative to said casing, and means for holding said rod against inward movement relative to said tube.

9. The combination with a pencil casing, of a slidable tube capable of carrying a lead and arranged to recede when under the influence of normal writing pressure, means, including a one way clutch and a device arranged to engage the lead, for holding the lead against inward movement during receding movement of said tube, and a one-way clutch for locking said device and said tube together during outward movement of the latter.

10. The combination with a pencil casing, of a slidable tube in said casing capable of carrying a lead and arranged to gravitate in the forward direction, means for limiting the forward movement of said tube, means, including a device arranged to engage the lead, for holding the lead against inward movement, and a oneway clutch for locking said device and tube together whereby said device and lead move with said tube upon gravitation thereof.

11. The combination with a pencil casing, of a slidable tube in said casing and movable inwardly relative thereto and capable of carrying a lead and arranged to gravitate in the forward direction, means for limiting the forward movement of said tube, means, including a rod arranged to engage the lead for holding it against inward movement, and a one-way clutch carried by said rod and engageable with said tube to lock said rod and tube together when the latter gravitates outwardly.

12. In a lead pencil, the combination of a casing and automatic lead propelling means within said casing, said means comprising inner and outer relatively movable members, one thereof supporting a lead and consisting of a tube which extends beyond one end of said casing and is free to recede when under the influence of normal writing pressure, and to gravitate outwardly when the pressure is relieved, and the other of which consists of a rod extending into said tube to engage the lead therein and a one-way clutching mechanism arranged to act through said rod to prevent inward movement of the lead, but arranged to move with said tube when the latter moves outwardly.

13. In a lead pencil, the combination with a casing, of means within said casing and suitably arranged for carrying a marking element, a backing for said marking element, and automatic propelling means for said backing, said propelling means being operable through the action of gravity and automatic in that it is effected by the customary actions of writing.

14. In a lead pencil, the combination with a casing, of means within said casing suitably

arranged for carrying a marking element, and automatic propelling means for said marking element, said propelling means including a sliding device movable to a limited extent under writing pressure against the influence of gravity and slidable to a limited extent under the influence of gravity when writing pressure is relieved to feed the marking element a limited distance.

15. In a lead pencil, the combination with a casing, of means within said casing and suitably arranged for carrying a marking element, and automatic propelling means for said marking element, said propelling means being operable through the action of gravity and automatic in that it is effected by the customary actions of writing.

16. In a lead pencil, the combination with a casing, of a lead carrying tube slidable in said casing, means arranged to retard forward movement of the lead, automatic propelling means for the lead, said propelling means being automatic in that it becomes effective through the customary action of writing, and a device carried by the free end of said tube and enveloping said retarding means and arranged to form a smooth writing point for rubbing contact with the surface being written upon while writing is progressing.

17. In a lead pencil, the combination with a lead carrying tube, the end of said tube being slotted and thereby suitably arranged to grip the lead and retard forward movement thereof, and a casing enveloping said slotted tube end and arranged, with respect to the lead, for rubbing contact with the surface being written upon while writing is progressing.

18. In a pencil, the combination with the casing thereof, of a slidable tube capable of carrying a lead and arranged to gravitate in the forward direction, means for limiting the forward movement of said tube, and automatic propelling means for said lead, said propelling means being automatic in that it becomes effective in propelling said lead relative to said casing while the pencil is subjected to the customary action of writing.

19. A lead pencil comprising a casing, a tube movably mounted in said casing and adapted to slidably support a lead, a lead propelling device in said tube, said tube being arranged to freely gravitate between limits together with the lead in the forward direction and to recede inwardly relative to the lead when under the influence of normal writing pressure, and oneway clutch means having elements engageable with said casing to prevent inward movement of said propelling device while permitting inward movement of said tube relative to the lead and said device and arranged to lock said device and tube together when the latter gravitates forwardly.



20. In a lead pencil comprising a casing,  
a lead carrying tube, said tube being arranged  
to freely gravitate together with the lead in  
the forward direction and recede when under  
the influence of normal writing pressure,  
5 means capable of holding the lead against in-  
ward movement while said tube recedes, and  
a stop arranged to limit forward movement  
of said tube.

10 21. In a lead pencil the combination of a  
casing, a lead carrying tube free to gravitate  
in the forward direction, means which holds  
the lead against inward movement relative  
to said tube, means which holds the lead  
15 against inward movement relative to said cas-  
ing, and a stop arranged to limit forward  
movement of said tube.

In testimony whereof I affix my signa-  
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