Nov. 14, 1939. H. A. WARD 2,179,835

STEP-BY-STEP LEAD PENCIL

Filed July 2, 1938

Fig.1.

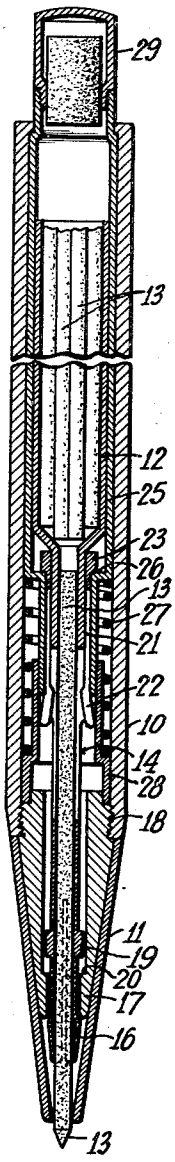


Fig.2.

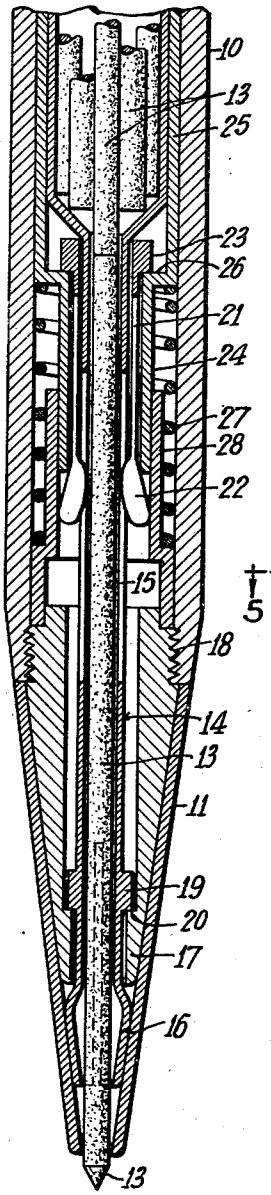


Fig.3.

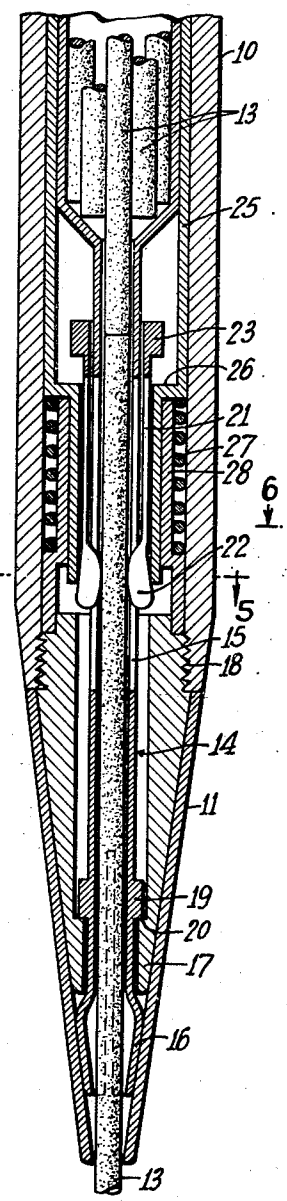


Fig.4.

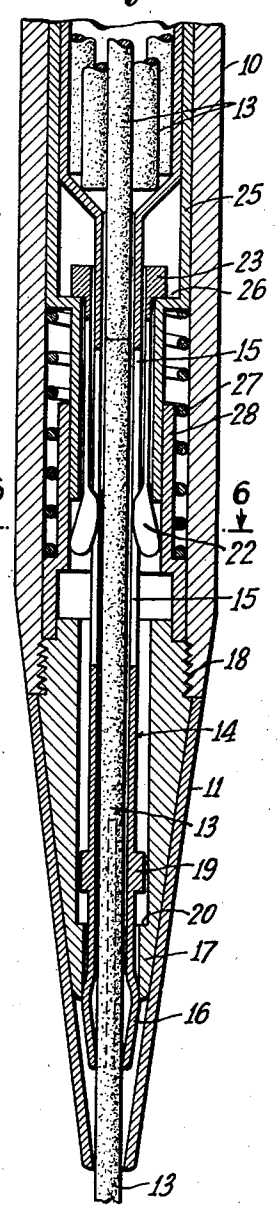


Fig.6.

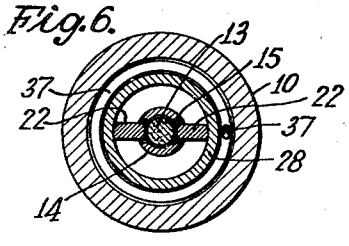
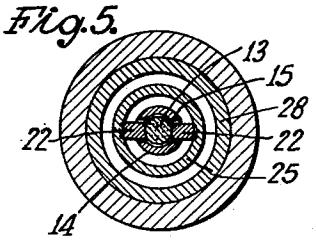


Fig.5.



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STEP-BY-STEP LEAD PENCIL

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9 Claims. (Cl. 120—17)

This invention relates to so-called "step-by-step" pencils and finds one of its preferred embodiments in a magazine pencil of the type which effects the advance of a new length of lead into writing position by a simple manual thrust, the lead feeding being conveniently accomplished by one handed manipulation by the user.

One of the main objects of the invention is to provide a construction which will eliminate or lessen the possibility of jamming or other accidental derangement of the feeding mechanism. This involves an automatic lead guiding, lead gripping, and lead advancing mechanism which is inaccessible to the user of the pencil, yet which is positive in its action.

Among the problems involved in the construction of a pencil of this type are:

(1) Holding the lead in writing position,

(2) Preventing a lead from dropping out of the barrel during the lead advancing movement, and

(3) The positive gripping and movement of the lead toward forward position.

A feature of the preferred embodiment of the invention is the provision of means whereby the lead at no part of the operation cycle can escape gravitationally from its holding and feeding mechanism.

The preferred embodiment of the invention makes use of two lead clamping members, one of which is effective to grip the lead in its normal writing position. The second lead gripping member serves as the lead advancing means, and in the operation of the pencil the timing is such that one lead clamping member engages the lead substantially simultaneously with the release of the lead by the other.

The invention provides a mechanism which is positive in action, which is rugged and durable in construction, which may be assembled with facility and expedition, and which is well suited to meet the requirements of economical manufacture and to withstand the rigorous abuse of casual or careless handling or manipulation.

The invention accordingly comprises an article of manufacture possessing the features, properties, and the relation of elements which will be exemplified in the typical article hereinafter described, and the scope of the application of which will be indicated in the claims.

One embodiment of the invention will now be described, as a non-limiting example, in connection with the accompanying drawing, in which:

Figure 1 is a vertical section showing the mechanism in normal or writing position;

Figure 2 is an enlarged partial view in vertical section showing the parts after the first step in the downward or working stroke;

Figure 3 is a view similar to Fig. 2, but showing the parts at the end of the working stroke;

Figure 4 is a view similar to Fig. 2, but showing the parts toward the end of the upward or idle stroke;

Figure 5 is a transverse section on the line 5—5 in Fig. 3; and

Figure 6 is a transverse section on the line 6—6 in Fig. 4.

Fig. 1 shows the pencil of the invention with the parts in position for writing; hereafter and in the claims, this position will be called the normal position. As is customary in speaking of magazine pencils, movement of the parts towards and away from the tip will be called respectively, downward and upward movement. For purposes of description, casing 10 and tip 11 will be assumed to be stationary.

Magazine 12, for leads 13, and slotted lead guide tube 14 connected therewith are movable within the casing. Guide tube 14 is provided with lateral slots 15 and has at its lower end outwardly spring-pressed lead-gripping jaws or fingers 16. Jaws 16 are normally held in cam relation with collar 17 for forcing them in gripping engagement with lead 13. Collar 17 is preferably formed of conical shape, soldered to tip 11, and secured in casing 10 by threaded connection 18. The downward movement of guide tube 14 is limited by shoulder 19, adapted to impinge on seat 20 on the inside of collar 17.

Slidably mounted on guide tube 14 is a gripper unit 21 including spring jaws 22 inserted in slots 15 of the guide tube and normally out of engagement with the lead therein, as shown in Fig. 6. At the top of the gripper unit, there is provided a shoulder 23. To operate the grippers, there are provided means such as sleeve 24, connected to actuating sleeve 25, and provided with seat 26 for receiving shoulder 23. Sleeve 25 is capable of independent movement with respect to both casing 11 and guide tube 14, but has sufficient frictional engagement with magazine 12 to carry said member with it during a portion of its movement. It is normaly held in upward position by the action of spiral spring 27. Preferably there is provided a protective sleeve 28 for preventing deformation of spring 27 and held in place by the pressure thereof. Sleeve 25 extends above the top of casing 10 and may terminate in a push button type of cap 29 as shown, or may instead

be capped by an upper casing member adapted to telescope with lower casing member 11.

The operation of the feeding mechanism is accomplished by depressing cap 29 from the normal position shown in Fig. 1, various stages of the feeding action being shown in Figs. 2, 3, and 4. When sleeve 25 first begins to move downward, by reason of its frictional engagement therewith it carries with it magazine 12 and guide tube 14 until the movement of the latter is arrested by shoulder 19 striking against seat 20, which position is shown in Fig. 2. This amount of movement by guide tube 14 is sufficient to carry jaws 16 out of contact with collar 17 and cause them to release their grip on lead 13. Practically simultaneously with this action, as sleeve 25 continues its downward movement, it carries sleeve 24 along gripper unit 21 until it engages jaws 22 and forces them by cam action to grip lead 13, as shown in Fig. 5, and feed it forward in guide tube 14. This downward movement continues until sleeve 25 strikes the upper end of sleeve 26, as shown in Fig. 3.

When pressure on cap 29 is released, spring 27 causes sleeve 25 to retract, carrying with it magazine 12 and guide tube 14 until movement of the latter is arrested by the engagement between collar 17 and jaws 16, which causes the latter to grip and hold the lead. Thereafter, sleeve 25 continues to retract under the urging of spring 27, carrying along with it gripper unit 21 by reason of the engagement between seat 26 and shoulder 23, grippers 22 being out of engagement with the lead as shown in Fig. 6. This retracting movement continues until all the parts regain normal position.

It will be seen that the invention provides mechanism which is at the same time both simple and positive in action. Moreover, the mechanism of the invention is unlikely to jam or otherwise get out of order, on account of its simplicity and the continuous passage provided for the lead from the magazine to the tip.

Since certain modifications in the article which embody the invention may be made without departing from its scope, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a step-by-step pencil, a casing and tip; a magazine member and slotted lead guide tube connected therewith, said guide tube being provided at its outer end with releasable jaws and being capable of movement with respect to said tip; said tip being adapted to force said jaws into gripping position when said parts are in writing position; gripper means slidably mounted on said guide tube for propelling said lead towards said tip; and sleeve means capable of movement with respect to both said guide tube and said tip, for operating said gripper means.

2. In a step-by-step lead pencil, a casing and conical tip connected therewith; a lead magazine and slotted guide tube connected therewith and reciprocable with respect to said tip; said guide tube being provided at its lower end with releasable jaws; means for causing said jaws to grip the lead and thus limit upward movement of said tube; means for limiting downward movement of said tube; releasable gripper means slidably mounted on said guide tube and extending into the slots therein; and an exteriorly accessible, spring-controlled sleeve member for operating said gripper means to advance a lead through said guide tube, said sleeve member being movable with respect to both said tube and said tip.

3. In a step-by-step lead pencil including a casing and tip, lead feeding means comprising in combination, a lead magazine member and slotted guide tube connected therewith and providing a passage to said tip, said tube being provided at its lower end with releasable jaws, said jaws being held in gripping engagement with the lead by cam contact with said tip when said parts are in writing position, said tube being capable of sufficient movement with respect to said tip to release said jaws; gripper means slidably mounted on said guide tube and adapted to grip said lead through said slots; and an exteriorly accessible, spring-controlled sleeve for operating said gripper means.

4. In a step-by-step lead pencil including a casing and tip, lead feeding means comprising in combination, a lead magazine member and slotted guide tube connected therewith and providing a passage to said tip, said tube being provided at its lower end with releasable jaws, said jaws being held in gripping engagement with the lead by cam contact with said tip when said parts are in writing position, said tube being capable of sufficient movement with respect to said tip to release said jaws; gripper means slidably mounted on said guide tube and adapted to grip said lead through said slots; and an exteriorly accessible, spring controlled sleeve for operating said gripper means, said gripper means being provided at its upper end with a shoulder, and said sleeve being provided with an interior seat adapted to receive said shoulder and support said gripper means.

5. A step-by-step magazine lead pencil comprising in combination, a casing and tip; a lead magazine and slotted lead guide tube connected therewith and movable with respect to said casing; said guide tube being provided at its lower end with releasable jaws; stationary means in cam relation with said jaws for forcing the same to grip the lead; means for limiting the movement of said guide tube; releasable gripper means slidably mounted on said guide tube and adapted to grip the lead through the slots in said tube; and exteriorly accessible operating means for said gripper means for causing the same to grip and advance the lead towards said tip and then to release it and return to normal position.

6. A magazine lead pencil comprising in combination, a casing and tip; a magazine member and slotted lead guide tube connected therewith and movable with respect to said tip, the lower end of said guide tube being provided with releasable jaws; means for causing said jaws normally to grip the lead; gripper means slidably mounted on said guide tube and adapted to extend into the slots in said tube and grip and advance the lead therein, said gripper means being normally in a retracted position; operating means for said gripper means; and an exteriorly accessible, spring controlled actuating member, said operating means acting in response to movement of said actuating member first to move said guide tube out of contact with said jaw-closing means, then to cause said gripper means to grip and advance the lead, and thereafter to return said guide tube and said gripper means to normal position.

7. In a step-by-step magazine lead pencil, in-

cluding a casing having a tip at its lower end, a magazine member and slotted lead guide tube connected therewith and providing a passage to said tip, said tube being provided at its lower end with releasable jaws normally in cam engagement with said tip for gripping said lead in writing position, said tube being capable of sufficient movement with respect to said tip to release said jaws; gripper means slidably mounted on said guide tube and adapted to grip said lead through said slots; exteriorly accessible actuating means; and operating means acting normally to hold said grippers in retracted position and out of engagement with said lead, and acting in response to the operation of said actuating means first to advance said guide tube to release said jaws, then to force said grippers to grip and advance said lead, then to permit said guide tube to retract and force said jaws again into gripping position, and then to cause said gripper to release said lead and to return to normal position.

8. A step-by-step lead pencil, comprising in combination a casing provided with a conical tip; a lead magazine and slotted lead guide tube connected therewith and reciprocable within said casing, said guide tube being provided at its lower end with releasable lead-gripping jaws; stationary camming means in said tip for forcing said jaws normally into gripping position; means for limiting the movement of said guide tube; a gripper unit slidably mounted on said guide tube and provided with releasable jaws extending into the slots therein for gripping and feeding the lead; said gripper unit being provided at its upper end with a shoulder; and an externally accessible, spring controlled sleeve for operating said gripper unit, said sleeve being interiorly provided with a seat for receiving said shoulder on said gripper unit to retract the same to normal position after each working stroke.

9. A step-by-step lead pencil, comprising in combination a casing provided with a conical tip; a lead magazine and slotted lead guide tube connected therewith and reciprocable within said casing, said guide tube being provided at its lower end with releasable lead-gripping jaws; stationary camming means in said tip for forcing said jaws normally into gripping position; means for limiting the movement of said guide tube; a gripper unit slidably mounted on said guide tube and provided with releasable jaws extending into the slots therein for gripping and feeding the lead; said gripper unit being provided at its upper end with a shoulder; and an externally accessible, spring controlled sleeve for operating said gripper unit, said sleeve being interiorly provided with a seat for receiving said shoulder on said gripper unit to retract the same to normal position after each working stroke, and a stationary sleeve for preventing deformation of said spring and adapted to telescope with said operating sleeve and limit the downward movement thereof.

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