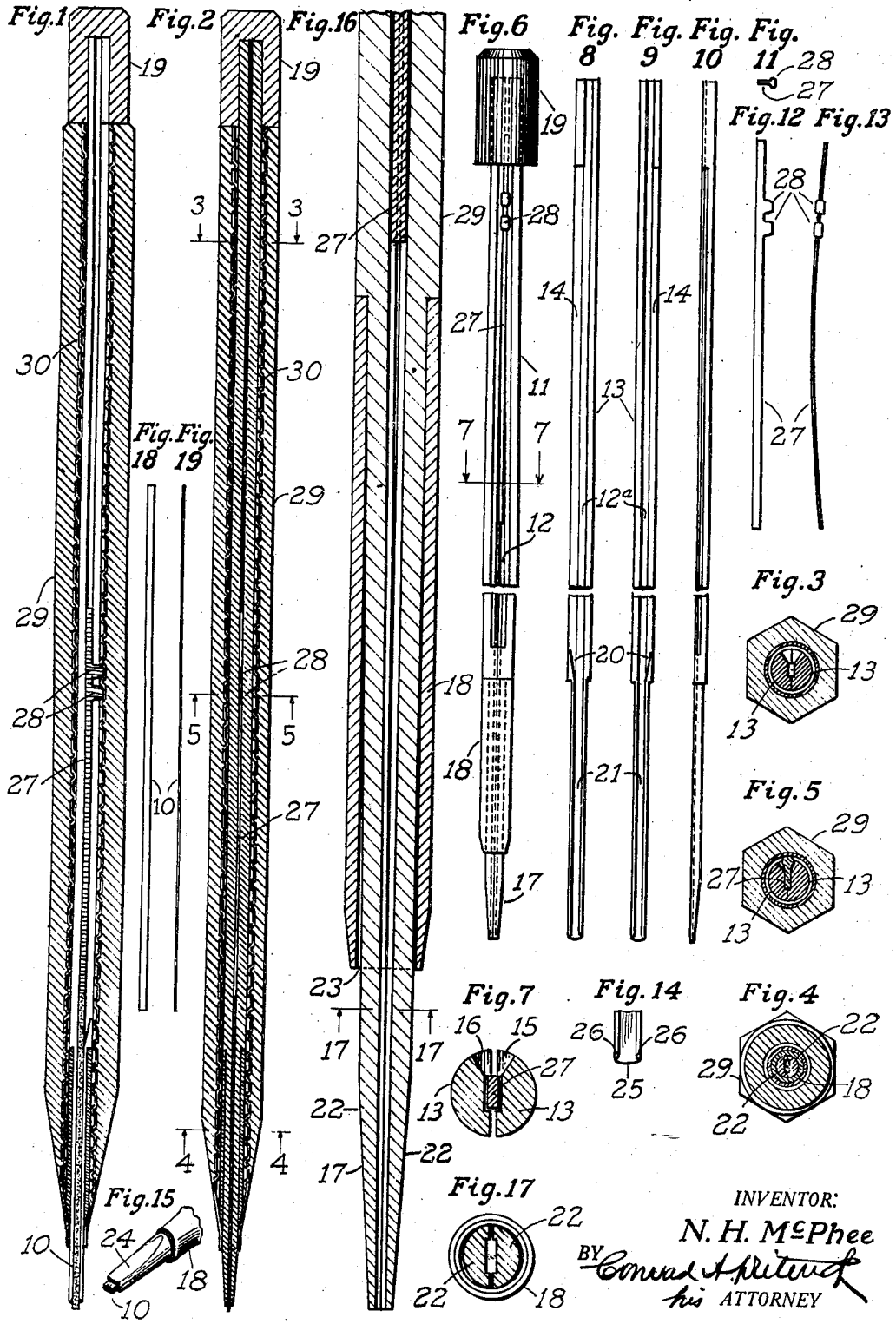
Oct. 10, 1939. N. H. McPHEE 2,175,210

MECHANICAL PENCIL

Filed Jan. 13, 1937 2 Sheets-Sheet 1



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MECHANICAL PENCIL

Filed Jan. 13, 1937 2 Sheets-Sheet 2

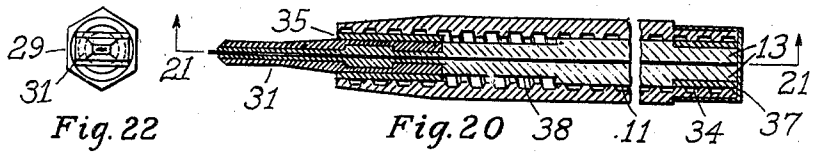


Fig. 22 Fig. 20

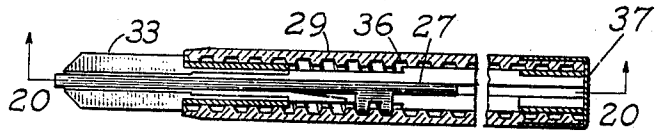


Fig. 21

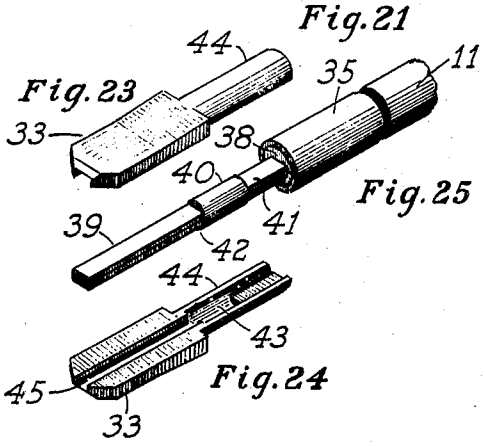


Fig. 23 Fig. 25 Fig. 24

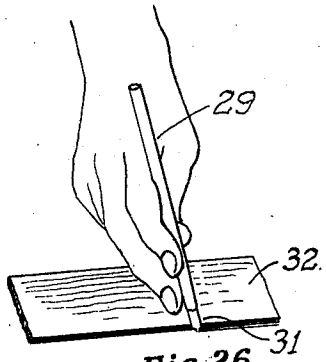


Fig. 26

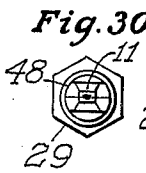


Fig. 30

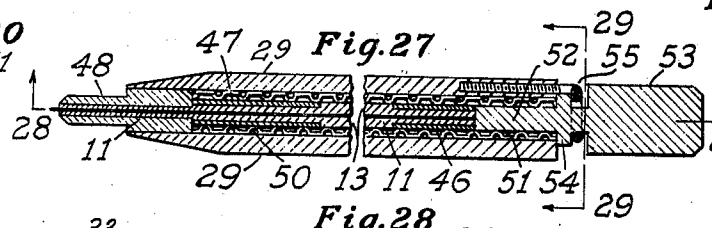


Fig. 27 Fig. 28

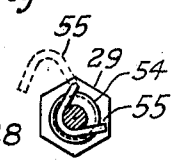
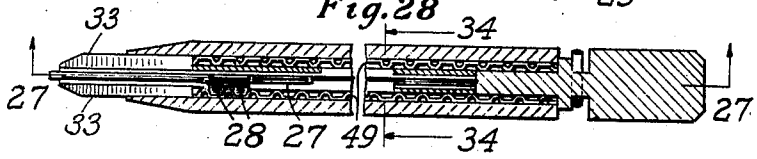


Fig. 29



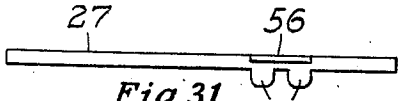


Fig. 31

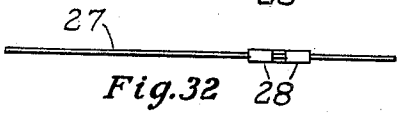


Fig. 32

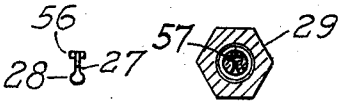


Fig. 33

Fig. 34

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Patented Oct. 10, 1939 2,175,210

UNITED STATES PATENT OFFICE

2,175,210

MECHANICAL PENCIL

Nathaniel H. McPhee, New Rochelle, N. Y.

Application January 13, 1937, Serial No. 120,346

19 Claims. (Cl. 120—18)

My invention relates to improvements in mechanical pencils, and the same has for its object to provide a simple, efficient and reliable device, which is particularly adapted for use in mechanical drafting.

Further, said invention has for its object to provide a device of the character specified which utilizes a flat, relatively thin marking element capable of making at will either a fine or light line or heavier shade line which will not vary in width or become heavier as the marking element wears down in the course of use thereof.

Further, said invention has for its object to provide a device of the character specified in which the holding or guiding means for the marking element serves to effectively confine or reinforce the element laterally to enable the feeding thereof without breakage.

Further, said invention has for its object to provide a device of the character specified in which the marking element is effectively gripped at the marking end to prevent slippage thereof relative to the holding member or carrier.

Further, said invention has for its object to provide a device of the character specified in which the holding or guiding member for the marking element includes means for allowing the introduction of said marking element lengthwise through the wall thereof.

Further, said invention has for its object to provide a device of the character specified in which said holding or guiding member is expansible and contractible to allow the ready introduction of the marking element thereinto and the subsequent confinement and clamping thereof within the guiding member.

Further, said invention has for its object to provide a device of the character specified in which the guiding or holding member for the marking element comprises longitudinal sections secured together at spaced points to cause the same to normally expand or spread between said points.

Further, said invention has for its object to provide a device of the character specified in which the working end or tip thereof include means serving as a leverage adapted to cooperate with the ruler or straight edge for feeding the marking element.

Further, said invention has for its object to provide a device of the character specified in which the guiding member or element holder and the casing or barrel enclosing the same are fixed relative to each other to prevent rotation of the flat marking element during the feeding thereof.

Further, said invention has for its object to provide a novel marking element particularly adapted for use with the device embodying my said invention.

Other objects will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends my invention consists in the novel features of construction, and in the combination, connection and arrangement of parts hereinafter more fully described and then pointed out in the claims.

In the accompanying drawings:

Figure 1 is an enlarged longitudinal section of one form of pencil constructed according to and embodying my said invention;

Fig. 2 is an enlarged longitudinal section thereof taken at right angles to Fig. 1;

Fig. 3 is a cross-section thereof taken on the line 3—3 of Fig. 2;

Fig. 4 is a cross-section thereof taken on the line 4—4 of Fig. 2;

Fig. 5 is a cross-section thereof taken on the line 5—5 of Fig. 2;

Fig. 6 is an enlarged longitudinal elevation of the guiding or holding member for the marking element;

Fig. 7 is a cross-section thereof on the line 7—7 of Fig. 6;

Figs. 8 and 9 are longitudinal views of the two sections forming the member shown in Fig. 6, looking at the grooved faces thereof;

Fig. 10 is an edge view of one of said sections;

Fig. 11 is an end view of the follower or feeding member;

Fig. 12 is a side elevation thereof;

Fig. 13 is an edge view thereof;

Fig. 14 is an enlarged detail of the lower end of one of the segments or sections of the guiding member;

Fig. 15 is a perspective of the lower or working end of the lead guiding member;

Fig. 16 is an enlarged longitudinal section of the lower end of the pencil;

Fig. 17 is a cross-section thereof taken on the line 17—17 of Fig. 16;

Fig. 18 is an elevation showing the flat side of the lead, crayon or other marking element employed in the pencil;

Fig. 19 is an edge view of said marking element;

Fig. 20 is a longitudinal section of a modified form of pencil in which the marking element may be advanced or fed automatically, said view being taken on the line 20—20 of Fig. 21;

Fig. 21 is a longitudinal section thereof taken on the line 21—21 of Fig. 20;

Fig. 22 is an end view of said pencil;

Figs. 23 and 24 are perspective views showing the outside and the inside of the sections or halves for reinforcing the tip of the pencil and constituting lateral wings therefor;

Fig. 25 is a perspective view of the tip of the lead holder adapted for the attachment of the sections shown in Figs. 23 and 24;

Fig. 26 is a view illustrating the operation of the automatic feeding pencil shown in Figs. 20 to 25;

Fig. 27 is a longitudinal section of another modification of the pencil embodying the invention, taken on the line 27—27 of Fig. 28;

Fig. 28 is a longitudinal section thereof taken on the line 28—28 of Fig. 27;

Fig. 29 is a cross-section taken on the line 29—29 of Fig. 27;

Fig. 30 is an end view of said pencil;

Figs. 31 to 33 are side, edge and end views respectively of the follower or pusher bar, and

Fig. 34 is a cross-section of the pencil taken on the line 34—34 of Fig. 28.

Referring to the drawings, and particularly to Figs. 1 to 19, the device embodying my said invention is particularly adapted for use in making mechanical drawings including either fine or thin or broad or shade lines of uniform width. For this purpose, I provide an elongated marking element 10 which is substantially flat or strip-like having a minimized thickness rendering the same extremely thin and capable of making fine lines without variation in the width of the lines as the lead or marking element wears down in the course of use. The marking element is illustrated in the face view shown in Fig. 18 and in the edge view illustrated in Fig. 19. The element 10 is of rectangular cross-section and of a dimension insuring a fine line of uniform width as the marking element wears down in the course of use without requiring sharpening and without variation in the width of the marking edge thereof. The leads or marking elements employed may be manufactured by extrusion or other methods of any desired cross-sectional area and may be effectively employed in the pencil embodying my invention. Leads have been made by me having a width of .036 of an inch and a thickness of .005 of an inch. Leads as thus made are so flexible as to require when being used to be closely confined and laterally supported throughout the length thereof substantially to the operating edge. The lead because of the flexibility does not readily break when dropped.

The pencil for receiving the marking element as above described comprises a holding or guiding member 11 having a passage 12 longitudinally thereof of a rectangular shape corresponding to that of the lead. The holder 11 preferably comprises two opposing flexible metallic sections 13 having longitudinal grooves 12a and elongated recesses 14 cooperating to form a longitudinal slot 15 communicating with the passage 12 formed by the two grooves 12a. The walls of the slot 15 are preferably tapered, as indicated at 16 to facilitate the introduction of the element 10 edgewise into the holder 11. The sections 13 cooperate to form a member 11 which is cylindrical externally. The working end 17 of the holder 11 is of reduced cross-section and supports the sleeve 18 for holding the sections together at the lower end thereof. The upper end of the holder 11 is secured together by the knurled head or member 19 serving as an actuator for rotating the holder 11. The two sections 13 are preferably resilient or flexible and upon removal of the sleeve 18 will flare or diverge towards the unsecured ends thereof. When the said sections are secured or clamped together, at spaced points, by the sleeve 18 and head 19 they tend to expand, bow or spread apart between the points of securement, as shown at Figs. 6, 7, and 16, thereby enlarging the slot 15 to facilitate the introduction of the lead or element 10. The two sections 13 are preferably beveled at the lower end of the slot 15, as indicated at 20, for directing the marking element 10 into the tip 17 of the holder 11. The portion 21 of the passage 12 within the tip 17 is preferably less in width than the thickness of the lead 10 so that the working end of the lead tends to expand or spread the opposing portions 22 of the sections 13, whereby the lead is firmly gripped or clamped at the working or marking end thereof. In order to allow the slight separation of the portions 22, clearance 23 is preferably provided between the holder 11 and sleeve 18.

The working end or tip 17 of the holder 11 comprises opposite surfaces 24 paralleling the plane of the passage 12 or the wide dimension thereof and serving as guiding surfaces engageable with a straight edge or ruler when a line is to be drawn. The lower edge 25 of the pencil is preferably rounded or beveled to obviate sharp points liable to jab the paper, and the discharge end 26 of the passage 12 is preferably flared to prevent the shearing of the working end of the lead.

The holder 11 is adapted to receive a lead pushing member or follower 27 corresponding in cross-section to that of the lead 10 and passage 12 and preferably longitudinally bowed as shown in Fig. 13. The follower 27 when inserted in the passage 12 straightens out and yieldingly engages the walls of the passage 12 to prevent the follower from dropping into the slot 15. The follower 27 also includes the projecting thread portions or lugs 28 extending through the slot 15 and working therein. The holder 11 is enclosed or encased by a tubular member or barrel 29 having a threaded actuating member 30 where the inner surface thereof cooperating or coacting with the thread portions or lugs 28. When the members 11 and 27 are rotated relative to each other the follower 27 is advanced to feed the lead or marking element 10. The casing or barrel 29 also serves to compress the sections 13 to bring the same together in close fitting relation about the marking element 10 and follower 27 to retain the same in alignment and prevent displacement thereof into the slot 15. When it is desired to insert a lead or marking element the holder 11 may be readily withdrawn from the barrel 29 and the element then inserted edgewise through the expanded slot 15. Upon replacement of the barrel 29 the sections 13 are compressed to reinforce and confine the lead substantially throughout the length thereof, the gripping action on the lead being greater at the working end 17 of the holder.

In use the broad side of the lead or marking element is in line with the line of direction of the mark to be drawn, and the strain on the lead is in the plane of the wide dimension of the lead, this dimension being of an order to resist said strain. The width of the line to be drawn is determined by the thickness of the lead and inasmuch as this thickness is a minimum, very fine lines may be drawn, the successive lines remaining of uniform width as the lead wears down. It is therefore unnecessary to sharpen or sand

paper the lead in order to retain a point thereon.

Referring to Figs. 20 to 26 I have illustrated another form of the invention in which the tip 31 of the pencil is constructed to enable the lead or marking element to be automatically fed, as required, by a twisting motion of the pencil and by engagement of said tip 31 with the straight edge 32 as illustrated in Fig. 26. For this purpose, the tip 31 is preferably provided with laterally extended wings or edge-engaging portions 33 to give fulcrum or leverage for easy twisting of pencil against straight edge, etc. The portions 33 are preferably removable to enable the replacement thereof when the surfaces thereof are worn down by engagement with straight edge.

The pencil embodying the modified form of the invention comprises the tubular holding or guiding member 11 having the opposing resilient sections 13 secured together at the upper end by the sleeve 34 and at the lower end thereof by the members 33 retained in position thereon by the sleeve 35. The guiding member 11 contains the follower 27 cooperating with the threaded portion 36 of the barrel 29 serving to enclose the guiding member 11 and compress the sections 13. The barrel 29 and guiding member 11 at the upper ends are enclosed by the cap 37.

The guiding member 11 towards the tip thereof is provided with a reduced cylindrical portion 38 adapted to support the sleeve 35 in the retracted position thereof as shown in Fig. 25. The tip 39 of the member 11 is made substantially rectangular in external configuration and has a projecting cylindrical intermediate portion 40 forming recesses 41 at the back thereof and shoulders 42 at the lower end thereof. The wing members 33 are provided with grooves or recesses 43 at the inner sides thereof adapted to fit the tip portion 39 of the guiding member and interlocking with the cylindrical portion 40 to retain the same against movement longitudinally of the tip 39. The rear portions 44 of the members 33 are semi-cylindrical and coact to form a cylinder adapted to support the sleeve 35 for retaining the parts together about the tip 39. The lower portions 45 of the grooves 43 are preferably constructed to provide clearance between the members 33 and the tip portion 39 to allow a slight separation of the adjacent portions of the sections 13 by the marking element to cause the element to be gripped. The members 33 provide leverage, whereby upon a slight rotation of the pencil when held against the straight edge as shown in Fig. 26, the barrel 29 will be rotated to advance the follower 27 and feed the lead. The modification shown in Figs. 20 to 26 is in other respects like that shown in Figs. 1 to 20.

Referring to Figs. 27 to 34 I have illustrated another modification of the invention in which the guiding member or holder 11 is fixed relative to the barrel 29. The guiding member comprises the opposing sections 13 held together by the sleeves 46 and 47, the yieldable sleeve 47 preferably being slotted to provide clearance for the projecting portion 28 of the follower 27 as shown in Fig. 28. The tip of the guiding member or holder 11 is provided with an enlarged nose 48 having a rectangular portion inserted into and fitting the correspondingly shaped lower end of the barrel 29 to prevent relative rotation of the parts. The parts 11 and 48 have a loose fit to allow for expansion of holder 11 and at the same time prevent the turning of holder 11 within the nose 48. The space 49 provided between the member 11 and barrel 29 serves to receive a threaded tubular member 50 rotatably disposed therein and coacting with the projecting portion 28 of the follower to advance the same and feed the lead or marking element. The member 50 is open at the upper end thereof and extends beyond the upper end of the guiding member 11 to provide an opening 51 for receiving the end portion 52 of an actuating member 53. The member 53 fits the tube 50 closely to permit of the rotation thereof by the knob 53. The member 53 is provided with a shoulder 54 engaging the end of the barrel. The parts are locked in position against removal by the catch 55 threaded into the barrel 29 and movable into and out of engagement with the member 53 between the shoulder and knob thereof. The follower 27 is preferably provided with the laterally extending lugs 56 adapted to ride in the longitudinal recesses 57 of the lead receiving passage 12 to prevent the follower from falling out through the tapered slot 15. In this form of the invention the sections 13 of the guiding member are retained in engagement by the rotatable member 50.

In the embodiment of the invention shown in Figs. 27 to 34 the follower may be advanced without rotating the member 11 and thereby changing the angular position of the lead or marking element. This embodiment of the invention is particularly adapted for use on compasses for drawing circular lines of uniform width. When it is necessary to insert a new lead the catch 55 is thrown out of the way, and the parts withdrawn from the barrel. The enclosing member 50 may then be readily removed from about the member 11 to expose the slot 15 and allow the introduction of the lead.

By my invention I provide lateral support for extremely fragile, flexible lead of substantially rectangular cross-section and effectively feed the same as needed. The invention is particularly adapted for use in mechanical drafting for drawing lines with a straight edge, T-squares, etc. and of the required degree of fineness without requiring the lead to be constantly sharpened. The lead being of two dimensions lends itself readily to use with a compass. By repeatedly twisting the pencil slightly from one position to another in a compass the angle of the lead will be changed and enable the drawing of lines becoming progressively heavier until the full broad side of the lead is reached.

Having thus described my said invention what I claim and desire to secure by Letters Patent is:

1. A pencil comprising a guiding member having a longitudinal passage therein and a longitudinal slot for the introduction of a marking element into said passage, the opposing portions of said member forming the passage and slot being resilient and normally in expanded relation to enlarge said slot, a follower in said passage having a portion extending into said slot, and means disposed about said expansible guiding member serving to compress the same and to confine said marking element, and coacting with said extending portion of said follower for advancing the same.

2. A pencil comprising a guiding member consisting of opposing, resilient sections having shallow longitudinal grooves in the contiguous faces thereof forming a passage, and recesses in said faces extending outwardly from said grooves and forming a longitudinal slot communicating with said passage, said sections forming a passage therebetween of substantially greater depth than width for receiving a substantially thin, flat,

marking element insertable through said slot, said sections being secured together at points beyond the ends of said slot and being normally in expanded relation between said points for enlarging said slot to allow for the insertion of said marking element through said slot, a follower in said passage having a portion extending through said slot, and means enclosing said guiding member for bringing said sections together about said marking element and said follower and coacting with said follower for advancing the same.

8. A pencil including a guiding member com-

having recesses in said faces extending outwardly from said grooves to form a slot communicating with said passage for the insertion of the marking element therethrough into the passage, means for securing said sections together in engaged relation, a follower within said passage having a portion working in said slot, and means enclosing said member and coacting with said last-named portion for advancing the follower.

and coacting with said operating portion for advancing the follower.

12. A pencil including a guiding member comprising sections having grooves and recesses in the contiguous faces thereof forming respectively a central passage and a slot communicating with said passage for the insertion of a marking element into said passage, said sections being resilient and longitudinally bowed to normally enlarge the opening for the marking element, means in said passage for feeding the marking element, and means enclosing said guiding member and serving to compress said sections to confine the marking element.

13. A pencil including a guiding member comprising longitudinal sections having grooves in the contiguous faces thereof forming a passage and recesses in said faces extending outwardly from said grooves to form a longitudinal slot communicating with said passage, means for securing said sections together at opposite ends of said slot, said sections between said securing means being in expanded relation to enlarge the slot for the insertion of a marking element into the passage, a follower in said passage having a portion working in said slot, and means enclosing said sections for confining the same about said marking element and coacting with said follower portion for advancing the follower.

14. A pencil for a substantially thin, flat marking element including a guiding member comprising relatively yielding sections having longitudinal grooves in the contiguous faces thereof cooperating to form a central passage conforming to and receiving said marking element, and recesses in said faces extending outwardly from said grooves to form a slot communicating with said passage, a follower in said passage having a portion riding in said slot, and means enclosing said guiding member to confine the sections about said marking element and coacting with said slot riding portion for advancing the follower to feed said marking element.

15. A pencil including a guiding member comprising a pair of sections having longitudinal shallow grooves in the inner faces thereof forming a passage of substantially rectangular cross-section for receiving a correspondingly shaped marking element and recesses in said faces extending outwardly from said grooves and forming a slot communicating with said passage for the insertion of the marking element into the passage, the lateral walls of said grooves at the discharge end thereof being flared to provide an enlarged end opening for the marking element, a follower disposed in said passage, and having a portion working in said slot, and means enclosing said guiding member and coacting with said follower portion for advancing the same.

16. A pencil comprising a guiding member including a pair of sections having shallow longitudinal grooves in the contiguous faces thereof forming a passage of substantially rectangular cross-section, and recesses extending outwardly from said grooves and forming a slot communicating with said passage, means for securing said sections together, a follower in said passage having a portion extending through said slot, a barrel enclosing said guiding member and including a tip portion having an opening therein receiving the guiding member and retaining the same against rotation relative thereto, and an actuating member rotatively disposed between said guiding member and said barrel and coacting with said follower portion for advancing the follower.

17. A pencil comprising a pair of cooperating sections forming a guiding member and having longitudinal grooves in the inner sides thereof shaped to conjointly form a longitudinal passage of thin rectangular cross-section within the guiding member, the portions of said sections at one side of said passage extending continuously coextensively with said passage and being engageable with each other throughout, and the portions of said sections at the opposite side of said passage being recessed to form a longitudinal slot for the insertion of a marking element edgewise into said passage and being engageable with each other beyond the ends of said slot, members securing said sections together beyond the ends of said slot, a follower within said passage, and a member disposed about said guiding member and coacting with said follower to advance the marking element.

18. A pencil comprising a guiding member having a central longitudinal passage and a longitudinal slot for the introduction of an elongated marking element through the side of said guiding member and into said passage, the passage and slot-forming portions of said guiding member being resilient and normally in expanded relation to enlarge said passage and said slot to facilitate the introduction of the marking element into said passage, a follower in said passage, and a rotatable member enclosing said guiding member for coaction with said follower to advance the same and serving to maintain said resilient portions under compression and confine said follower and marking element within said passage.

19. A pencil as defined in claim 18 in which said passage corresponds in cross-section with that of a substantially rectangular marking element of such thinness and flexibility as to require external support substantially throughout its length.

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