Jan. 7, 1964 R. HAYWARD ETAL 3,116,720

PENS

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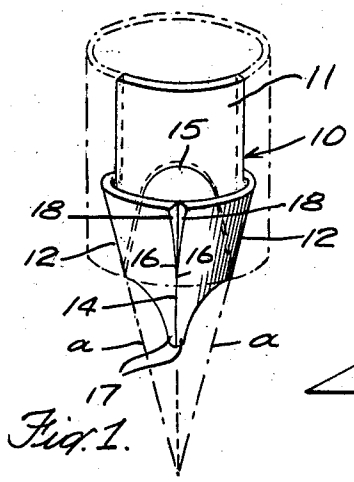


Fig. 1.

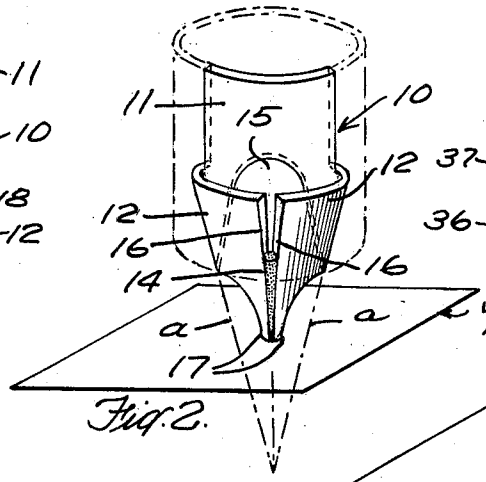
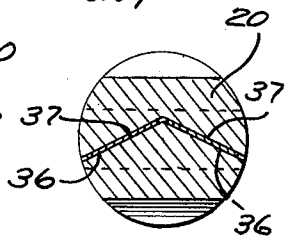


Fig. 2.

Fig. 8



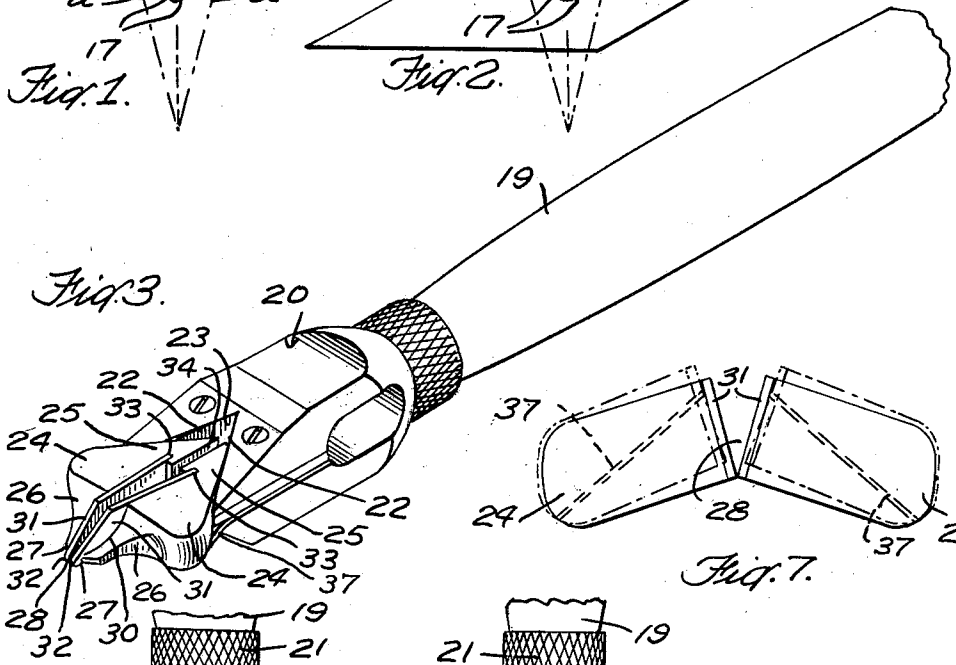


Fig. 3.

Fig. 7.

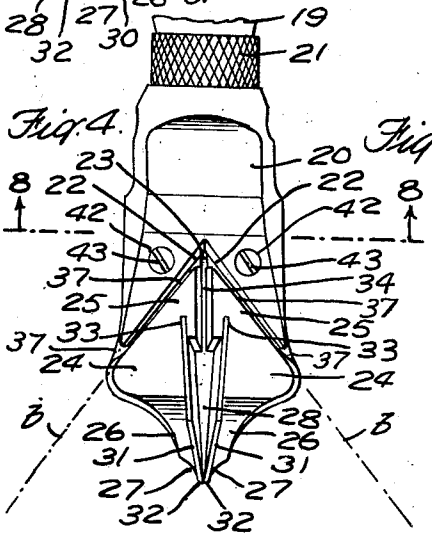


Fig. 4.

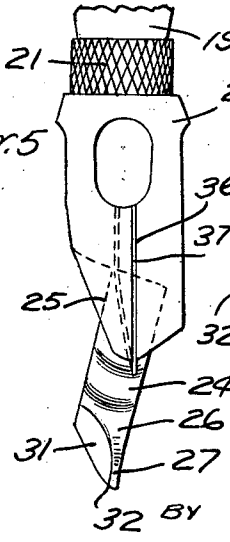


Fig. 5.

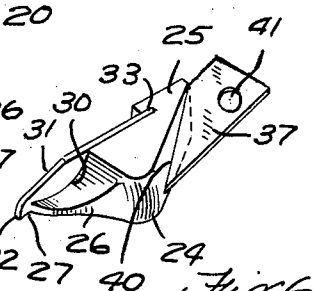


Fig. 6.

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Fig. 9.

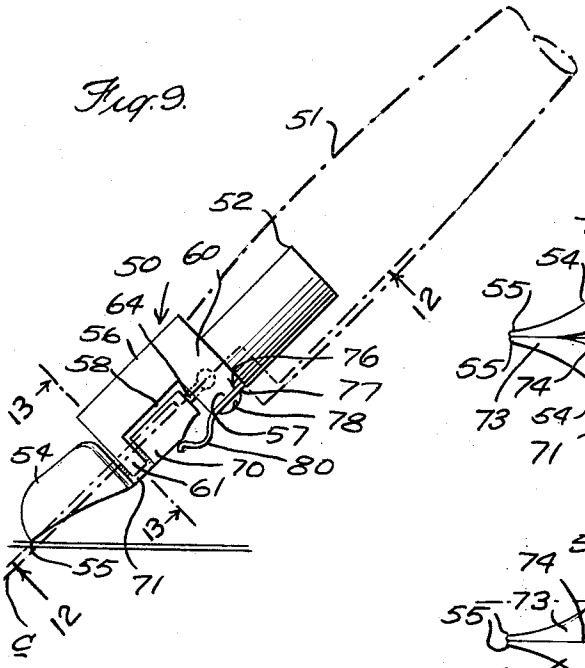

Fig. 10.

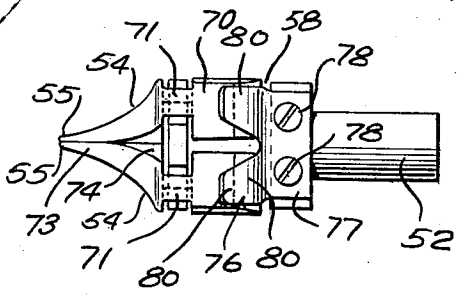

Fig. 11.

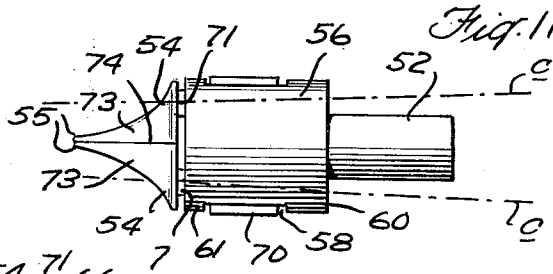

Fig. 12

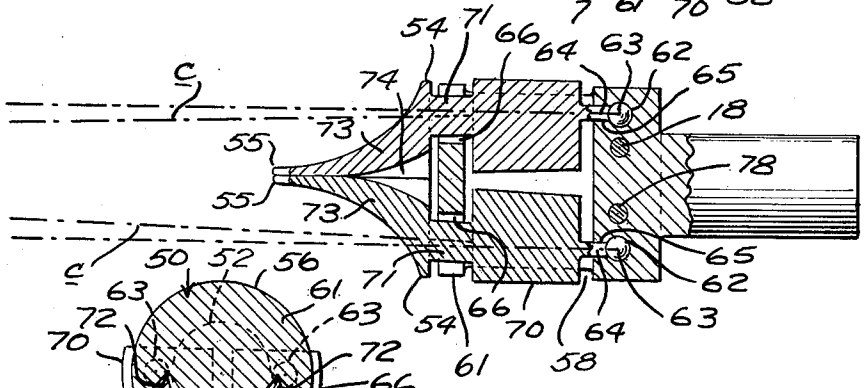

Fig. 13

Fig. 14

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14 Claims. (Cl. 120—109)

The present invention relates to pens.

The conventional pen is split to define two opposed nibs separated by a slit or juncture defining a feed channel for the ink, and as these nibs separate under pressure, the slit widens in accordance with a pattern of movement which tapers the slit rearwardly along the length of the pen. Capillary forces in such a rearwardly tapering slit tend to withdraw the ink from the tip of the pen and thereby make writing difficult and often cause the pen to write double scratchy lines.

One object of the present invention is to provide a new and improved pen constructed to cause capillary forces to assist in drawing ink towards the tip of the pen and thereby to afford smooth delivery of the ink to the paper in response to a wide range of nib pressures and to produce with such pressures smooth single lines.

Another object of the present invention is to provide a new and improved pen designed to reduce the incidence of blotting.

In accordance with certain features of the present invention, the nibs are separated by a slit or juncture, which in all writing conditions of the pen within the full permisible range of line widths, does not taper rearwardly. These nibs are hinged about respective axes arranged to separate the nibs at the tip by pressure in accordance with the desired width of the line to be penned but to an extent insufficient to reform the slit into a rearwardly tapering feed channel, thereby assuring easy positive feed of ink to the tip for lines of varying width.

Since capillary forces are greater in channels of small cross-sectional areas than they are in channels of greater cross-sectional areas, and since the distance between the boundaries of the ink channel in the improved pen of the present invention is no greater at the tip where the pen contacts the paper than it is at any other part of the pen along said channel within the full permissible range of line widths of the pen, the flow of ink towards the tip of the pen and into contact with the paper is assured by these capillary forces supplemented by the action of gravity. This is in contrast with conventional pens, in which the distance between the nibs under writing pressure is greatest at the tip in the region of paper contact.

As another feature of the present invention, the confronting sides of the nibs along the slit slant downwardly towards each other from the topside towards the underside of the pen, so that the slit defines a V-shaped feed channel assisting in capillary feed action and holding the ink on the upperside of the nibs. Blot hazards are thereby reduced.

Various other objects, features and advantages of the present invention are apparent from the following description and from the accompanying drawings, in which:

FIG. 1 is a front face view of a form of pen of the ink dip type embodying the present invention and shown in closed position;

FIG. 2 is a front face view of the pen of FIG. 1 but shown opened in the process of writing;

FIG. 3 is a perspective of another form of pen of the ruling or drawing type embodying the present invention and shown in conjunction with a pen holder;

FIG. 4 is a top plan view of the pen of FIG. 3;

FIG. 5 is a side elevation of the pen of FIG. 3;

FIG. 6 is a perspective of one of the nibs of the pen of FIG. 3;

FIG. 7 is a front elevation somewhat diagrammatic of

the pen of FIG. 3 but shown on a larger scale and shows in full lines the pen closed for drawing lines of minimum permissible width and showing in dot and dash lines the pen in open position for drawing lines of greater width;

FIG. 8 is a section of the pen of FIG. 3 taken on lines 8—8 of FIG. 3;

FIG. 9 is a side view of another form of pen of the ruling or drawing type embodying the present invention;

FIG. 10 is a bottom plan view of the pen of FIG. 9;

FIG. 11 is the top plan view of the pen of FIG. 9;

FIG. 12 is a longitudinal section of the pen taken on lines 12—12 of FIG. 9, but on a larger scale;

FIG. 13 is a transverse section of the pen taken on lines 13—13 of FIG. 9 but on a larger scale; and

FIG. 14 is a front elevation of the pen of FIG. 9 but showing in full lines the pen closed for drawing lines of minimum permissible width and showing in dot and dash lines the pen in open position for drawing lines of greater width.

The principles of the present invention can be applied to dip-pens, drawing pens and to fountain pens. FIGS. 1 and 2 illustrate the embodiment of the present invention in a pen of the dip type, the blank from which said pen can be made being shown in dot and dash lines. In this embodiment, the pen is formed in one piece from a generally cylindrical blank of hard resilient material, such as spring steel, and has a center frame body 10 constituting a segment of a cylinder and having an upper shank part 11 adapted to be inserted into the recess of a pen holder (not shown) in the usual manner. The lower part of the center frame body 10 has symmetrical side wing extensions 12 folded back reversely with respect to and substantially conformably against the outside of the pen body along hinge lines or axes *a* converging forwardly of the pen. The two side wing extensions 12 form nibs which meet along a slit or juncture line 14 extending in the longitudinal axial plane of the pen to form a feed channel for the ink and the two hinge lines *a* are symmetrically arranged with respect to this slit and meet in this plane. The lower part of the shank 11 has a recess 15 along the underside of the slit 14 to permit free access of ink to the underside of the pen when the pen is dipped into an ink well.

The nibs 12 have respective inner confronting sides 16, which come face to face along the slit 14 in the forward sections of the nibs to the tips 17 thereof when the pen is closed, as shown in FIG. 1, and which have bevelled confronting faces 18 at the outside and rear of the nibs converging forwardly towards the longitudinal axial plane of the pen and also towards the underside of the pen, as shown in FIG. 1. These bevelled faces 18 form a trough therebetween to pick up a substantial amount of ink when the pen is dipped in an ink well, even though the pen is closed.

As writing pressure is applied to the tip 17 of the pen, the nibs 12 are bent resiliently about the converging hinge lines *a*, thereby separating the nibs and opening the slit 14 to vary the width of the line being penned, as shown in FIG. 2. By this operation, the tip 17 of each nib 12 on the slit 14 moves in an arc in a plane at right angles to the corresponding hinge line *a*, and the rear of each nib along said slit also moves in an arc in a plane at right angles to said hinge line. Since the two arcs of movements of the nibs 12 at the opposite ends of the slit region are centered on their respective hinge lines *a*, and since these hinge lines are inclined in relation to the longitudinal line of the slit 14, the arc of movement of the tip 17 of each nib will have a radius smaller than that of the arc of movement of the rear of the nib along the slit 14. Because the sweep of the tip 17 of each nib 12 is smaller than that of the rear of the nib in the slit region for the same angular movement, the degree of

separation of the tips of the nibs is less than the degree of separation of the nibs in the rear section of the slit 14, so that the slit will taper towards the tip of the pen and a taper will be maintained in this slit for all writing pressures within the allowable range of the pen. This difference in degree between the separation of the nibs along the length of the slit 14 is more marked because the hinge lines *a* extend below the tip of the pen, and this location of the level of the hinge lines in relation to that of the tip of the pen also serves to cause the nibs to separate at the tip readily under the smallest writing pressure without being jammed together.

The bending of the nibs 12 apart under writing pressure will not only cause the confronting sides 17 of the nibs along the slit 14 to converge towards the tip of the pen but will also cause these sides along the full length of said slit to converge from the upperside towards the underside of the pen, thereby forming a V-shape trough serving as an ink reservoir to hold the ink near the upperside of the pen.

With this pen construction, the capillary forces will tend to feed the ink positively towards the smaller end of the slit 14 of the pen, i.e. towards the tip of the pen, so that constant smooth delivery of the ink at all times to the plane of writing contact of the pen is assured for all allowable writing pressures on the tip of the pen. Moreover, the V-shaped cross-section of the slit 14 serves to confine the ink above the underside of the pen, thereby reducing blot hazards.

As an alternative, the nib forming wing extensions instead of being reversely folded with respect to the pen body, as shown in FIGS. 1 and 2, may form continuations of said pen body extending in the same general direction except that they are conically shaped, but with this construction, the hinge lines would not be as definite and predetermined as are the hinge lines in the construction of FIGS. 1 and 2.

FIGS. 3–8 show the application of the principles of the invention to a ruling or drawing pen in which the ink is applied by means of a dropper or the like. In this construction, the pen is secured to a holder 19 by any suitable means. In the specific form shown, the pen includes at its rear end a pen frame body 20 having a cylindrical shank (not shown) fitting snugly into a hole (not shown) in the end of the holder 19. The end section of the holder 19 along the hole is split on diametrically opposite sides radially to the hole and is tightly embraced by a clamp ferrule 21.

The pen body 20 has at its forward end rearwardly converging faces 22 conjointly defining a V-recess 23 receiving the rear ends 25 of two similar nibs 24 hinged respectively to the two side sections of the pen body in the manner to be described. The rear ends 25 of the nibs 24 are bevelled to converge rearwardly and to define conjointly a cuneiform tail fitting somewhat conformably in the V-recess 23. The front ends 26 of the nibs 24 are also bevelled but converge forwardly and terminate in tips 27. The two nibs 24 are separated by a slit or juncture 28.

The pen body 20 and the nibs 24 may be made of metal, which may be brass or other similar material not hard enough to withstand writing abrasion, so that the inner confronting faces 30 of the nibs along the slit 28 are lined with hard metal plates 31, such as steel plates, projecting beyond the forward ends 27 of the nibs to define writing tips 32 for the pen. The lining plates 31 extend at their rears snugly into grooves 33 of the nibs 24 and may be further rigidly secured to the nibs by brazing or by adhesive.

In closed position of the pen, the confronting inner lined faces 30 of the nibs 24 converge forwardly along the slit 28 to the writing tip 32 and converge from the upperside towards the lowerside of the nibs to form a forwardly tapering slit in the form of a V-shaped channel. The rear sections of the nibs 24 are separated by a narrow space 34, which is of uniform width along its length when the pen is free from writing pressure, as shown in FIG. 4.

For hingedly securing the nibs 24 to the pen body 20, the pen body has two grooves 36 extending rearwardly from the recess 23 thereof and the nibs carry respective spring plates 37 projecting rearwardly from the bevelled ends 25 thereof and removably extending into said grooves respectively with snug fit. These spring plates 37 are permanently secured to the nibs 24 and for that purpose, the nibs have respective grooves 40 into which the forward sections of the spring plates fit snugly and in which these plates are permanently retained by brazing or by adhesive. The rear sections of the spring plates 37 have respective holes 41 which when the spring plates are set properly in their respective pen body grooves 36 register with holes 42 extending from the upperside to the bottomside of the pen body 20. The holes 42 receive studs 43, which pass through the holes 41 in the spring plates 37 when said plates are in proper position in the pen body grooves 36 to retain said plates against withdrawal and which are threaded into the sections of these holes below the grooves 36.

The spring plates 37 are slanted from the outside inwardly and upwardly to converge towards the upperside of the pen, as shown in FIGS. 7 and 8, and the rear bevelled ends 25 of the nibs 24 are close and parallel to the corresponding converging faces 22 of the pen body 20, so that the spring plates define predetermined hinge axes or lines *b* in the planes thereof extending in the regions between the bevelled ends 25 of the nibs 24 and the confronting faces 22 of the pen body. The sections of these hinge axes *b* opposite the ink retaining part of the slit 28 extend below the level of the undersides of said slit to assure against the jamming together of the opposite sides of the nibs 24 along said slit and especially the tips 32, as the nibs are pressured about said axes.

The nibs 24 are similar and the hinge axes *b* are symmetrically arranged with respect to the longitudinal axis of the slit 28 defining the ink feed channel and meet in the plane of said longitudinal axis rearwardly of the tips of said nibs. With the pen free from writing pressure, the slit 28 tapers longitudinally of the pen towards the tip end of the pen, as shown in FIG. 4, so that the capillary forces act to feed the ink towards said end of the pen. The side walls of the slit 28 converge towards the underside of the pen, thereby forming a V-shaped reservoir for the ink preventing the ink from escaping inadvertently in the form of blots.

As writing pressure is applied to the tip of the pen, the nibs 24 are tilted about the hinge axes *b*, thereby spreading the writing tips 32 of the nibs apart and correspondingly varying the width of the line penned. The tips of the nibs 24 move by this pressure action in an arc in a plane at right angles to the corresponding hinge axis *b* and the rear of each nib along the slit 28 moves in an arc in a plane at right angles to the corresponding hinge axis. Since the two arcs of movements of the nibs 24 at the opposite ends of the slit region are centered on their respective hinge axes *b* and since these hinge axes are inclined in relation to the longitudinal line or axis of the slit 28, the arc of movement of the tip of each nib will have a radius larger than that of the arc of movement of the rear of the nib along the slit. Because the sweep of the tip of each nib 24 is greater than that of the rear of the nib in the slit region for the same angular movement, the degree of separation of the tips of the nibs is greater than the degree of separation of the nibs in the rear section of the slit 28. However, the original taper of the slit 28 forwardly of the pen in the closed condition of the pen is so great, that in spite of the spreading of the tips of the pen at a greater rate than the other opposite points of the pen along the slit, the slit will retain a forward tapering conformation for the full range of line widths of the pen. Capillary forces will therefore urge

the ink towards the writing end of the pen for the full range of line widths of the pen.

The location of the hinge axes *b* below the levels of the tips 32 at the points of said axes where planes passing through said tips and normal to said axes intersect said axes, cause these tips to separate readily under the smallest writing pressure without being jammed together.

Not only is a longitudinal taper of the slit 28 towards the tip of the pen maintained during the application of different writing pressures as described, but the converging slants of the inner confronting sides of the nibs 24 in the slit 28 towards the underside of the slit are maintained, as shown in FIG. 7.

FIGS. 9–14 show another form of ruling pen comprising a pen frame body 50 secured to a holder 51 in any manner, as for example, in the manner described in connection with the construction of FIGS. 3–8. For that purpose, the pen body 50 has a cylindrical shank 52 adapted to fit in the split apertured end of the holder 51 and retained on said pen body by a clamping ferrule (not shown).

The pen body 50 pivotally supports two nibs 54, each terminating at its forward end in a writing tip 55. The pen body 50 is of generally semi-cylindrical form presenting a semi-cylindrical surface 56 on its upperside and a flat surface 57 on its lowerside. A groove 58 on the underside of the pen body 50 extending transversely thereof, forms a rear wall 60 and a front wall 61. The rear wall 60 near opposite sides thereof has two holes 62 extending from the flat surface 57 thereof to pivotally receive the ball ends 63 of spindles 64 extending rearwardly from the nibs 54 respectively. The rear wall 60 has slots 65 extending from the front surface of this rear wall to the holes 62 respectively to permit the spindles 64 with their enlarged ends 63 to be slipped through said slots and through said holes from the open ends thereof to the base of said holes. The bases of these holes 62 may be conical or spherical or otherwise similarly shaped to serve as bearings for the balled ends 63 of the spindles 64, and the width of the slots 65 is smaller than the width of these ball ends to retain said balls in the holes 62.

The front wall 61 has two V-shaped recesses 66 serving as fulcrum points for knife edges on the nibs respectively, as will be described.

Each nib 54 has a trunk 70 located in the groove 58, the spindle 64 extending as a tail from the rear end of said trunk, a neck 71 which has its upper edge shaped as a knife edge 72 preferably flanked with slightly concave sides and which extends into the corresponding V-shaped recess 66 of the pen body 50 so as to be fulcrummed against the crest thereof, and a head 73 of semi-cuneiform shape extending forwardly of the pen body and terminating in the writing tip 55. The nib heads 73 define therebetween a slit 74 serving as a feed channel for the ink. The nib heads 73 have their confronting inner faces along this slit 74 slanting divergently towards the underside of the pen, so that in closed positions of the pen, the upper edges of these faces extend close together in substantial parallelism, as shown in FIG. 11 and the lower edges of these faces converge forwardly towards the tips 55, as shown in FIG. 10.)

The depth of the holes 62 and of the fulcrum recesses 66 are such as to locate the lower surfaces of the nib trunks 70 substantially flush with the lower flat surfaces of the pen body 50 and the undersides of the nib heads 73 slant upwardly with slight curvatures to the writing tips 55 of these heads to locate these tips at a level above the level of the underside of the nib trunks 70.

The spindles 64 are in alignment with the crests of the fulcrum recesses along hinge axes *c*, which converge forwardly and which are symmetrically arranged with respect to the center longitudinal axis of the slit 74. These axes *c* meet in the plane of the longitudinal axis of the slit 74 forwardly of the tips 55 and are located below the lower level of these tips, as shown in FIG. 9.

For resiliently urging the nibs 54 into closed position, there is provided a spring 76 having a base section 77 secured to the underside of the rear wall 60 by screw studs 78 and having a pair of bowed spring fingers 80 bearing upwardly against the undersides of the trunks 70 of the nibs 54 respectively. These spring fingers 80 normally maintain the nibs 54 in the closed position shown in FIGS. 10, 11, 12 and 14.

As writing pressure is applied to the tip point of the pen, the nibs 54 rotate about the converging hinge axes *c* respectively, thereby separating the nibs and opening the slit 74 to vary the width of the line being penned. By this operation, the tip 55 of each nib 54 moves in an arc in a plane at right angles to the corresponding hinge axis *c*, and the rear of each nib head 73 along the slit 74 also moves in an arc in a plane at right angles to said hinge axis. Since the two arcs of movements of the nibs 54 at the opposite ends of the slit region are centered on their respective hinge axes *c* and since these hinge axes are inclined in relation to the longitudinal line of the slit 74, the arc of movement of the tip 55 of each nib will have a radius smaller than that of the arc of movement of the rear of the nib head 73 along the slit 74. Because the sweep of the tip 55 of each nib head 73 is smaller than that of the rear of the nib head in the slit region for the same angular movement, the degree of separation of these tips is less than the degree of separation of the nib heads in the rear section of the slit 74, so that the forward taper of the slit towards the tips 55 will be increased and maintained for all writing pressures within the allowable range of the pen. This difference in degree between the separation of the nibs 54 along the length of the slit 74 is more marked because the hinge axes *c* extend below the tips 55 of the pen, and this location of the level of hinge axes in relation to that of the tip of the pen also cause the nibs to separate at the tips readily under the smallest writing pressure without being jammed together. With a forward taper in the slit 74 maintained for the full range of line widths, smooth positive feed of the ink towards the writing point of the pen under the action of capillary forces will be assured.

The forward taper in the lower edges of the slit 74 rearwardly of the tips 55 shown in FIG. 10, assures against jamming of the nibs 54 together as they are pressed about the hinge axes *c*. Moreover, this taper affords additional ink storage space.

While the invention has been described with particular reference to specific embodiments, it is to be understood that it is not to be limited thereto but is to be construed broadly and restricted by the scope of the appended claims.

What is claimed is:

1. A pen having a pair of opposed nibs separated by an ink feeding slit and terminating at their forward ends in a writing tip, said slit being free from rearward taper in the absence of writing pressure on said pen, means supporting said nibs for separating movements about respective predetermined hinge axes upon application of writing perssure upon the pen and for spreading thereby said slit for ink feeding action, said supporting means controlling the separating movements of said nibs about said hinge axes and for maintaining thereby said slit free from rearward taper within the full permissible range of writing pressures, whereby no capillary forces are created in said slit tending to feed the ink away from the writing tip of the pen, said supporting means comprising means for moving the tips of the nibs apart to a lesser degree than other parts of the nibs along the slit as writing pressure is applied to the nibs.

2. A pen as described in claim 1, wherein said slit tapers longitudinally toward the writing tip of the pen within the full permissible range of writing pressures.

3. A pen as described in claim 1, wherein said hinge axes are symmetrically arranged on opposite sides of the slit.

4. A pen as described in claim 1, wherein said hinge axes are symmetrically arranged on opposite sides of the slit and converge forwardly of the pen.

5. A pen as described in claim 1, wherein said hinge axes are symmetrically arranged on opposite sides of the slit and converge rearwardly of the pen.

6. A pen made of one piece and having a center frame body having an upper shank part adapted to be secured to a pen holder and having wing extensions integral with the opposite sides of said frame body and bent about respective hinge axes converging forwardly of the pen, said wing extensions forming the nibs of the pen and meeting along a slit extending in the longitudinal center axial plane of the pen to form a feed channel for the ink, said nibs bending about said hinge axes when subjected to writing pressure and causing said slit to taper increasingly longitudinally towards the writing tip within the full permissible writing range of line widths.

7. A pen as described in claim 6, wherein said frame body constitutes substantially a segment of a cylinder and said nibs constitute substantially segments of a cone.

8. A pen as described in claim 6 wherein said nibs are reversely bent from the frame body along said hinge axes.

9. A pen comprising a pen body, a pair of nibs separated by a slit defining a feed channel for the ink, and means for hinging said nibs to said body for movement apart in response to pressure on said nibs and comprising spring plates secured to said nibs and to said pen body, said means moving the tips of the nibs apart to a less degree than other parts of the nibs along the slit, the nibs being close to said pen body in the regions of said spring plates to define hinge axes for the nibs in said spring plates in the regions between said pen body and said nibs, said slit being shaped and said hinge axes being located to taper said slit longitudinally forwardly within the full permissible writing range of line widths.

10. A pen as described in claim 9, wherein said pen body has a V-shaped recess at its forward end with two rearwardly converging faces, and the nibs have rear ends fitted substantially conformably in said recess and converging rearwardly in confronting close relationship to said converging faces respectively, said spring plates extending between said faces and said ends and said hinge axes converging rearwardly of the pen.

11. A pen as described in claim 9, wherein said spring plates are slanted inwardly and upwardly towards the upperside of the pen so that the hinge axes defined by said spring plates slant in corresponding directions.

12. A pen comprising a pen body presenting a rear wall and a forward wall separated by a recess, a pair of nibs pivotally supported on the rear wall and having respective fulcrum seating engagements with the front wall to support said nibs for angular movement about respective hinge axes, said nibs presenting heads projecting forwardly beyond the forward wall and terminating in respective writing tips, said nib heads defining therebetween a slit serving as an ink feeding channel, the application of pressure on said nibs causing said nibs to move angularly about said hinge axes respectively and thereby to vary the widths of the lines written, means for moving the tips of the nibs apart to a less degree than other parts of the nibs, said hinge axes being symmetrically arranged on opposite sides of the longitudinal center axis of the pen and converging forwardly towards the plane of said longitudinal axis, said hinge axes being located to taper the slit longitudinally forwardly within the full permissible writing range of line widths.

13. A pen as described in claim 12, wherein said hinge axes are located below the writing tips of the nibs.

14. A pen having nibs with an ink feeding channel therebetween terminating in a writing point, means mounting said nibs for separation in response to writing pressure thereon and simultaneously to increase the width of said channel beyond the writing point to an extent greater than the separation of said nibs at said writing point.

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