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J. M. KAHN ET AL

2,964,012

WRITING INSTRUMENT

Filed April 5, 1956

FIG. 1

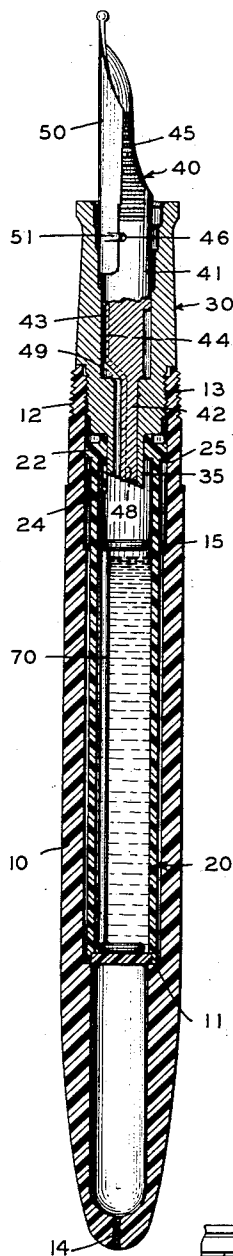


FIG. 2

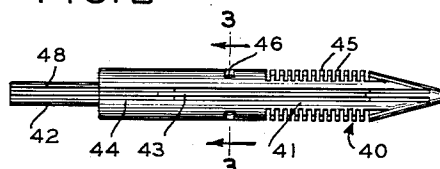


FIG. 3

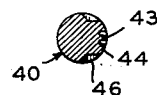


FIG. 5

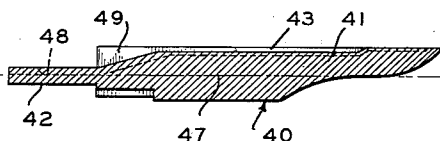


FIG. 4

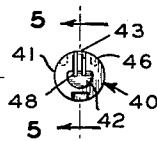


FIG. 6

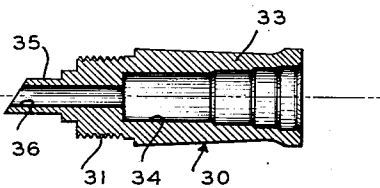


FIG. 7

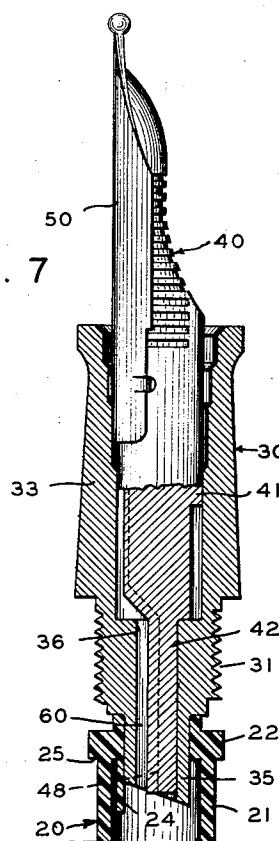


FIG. 8

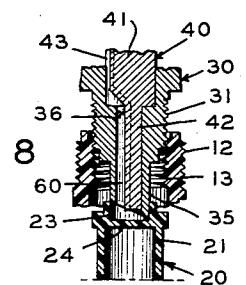


FIG. 9

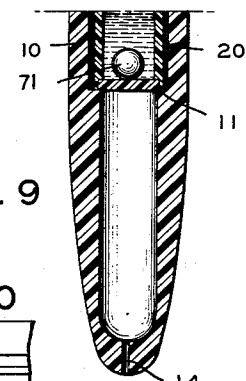
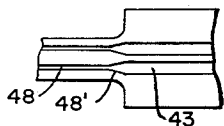


FIG. 10



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WRITING INSTRUMENT

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14 Claims. (Cl. 120—45.4)

The present invention relates to improvements in writing instruments and more particularly to writing instruments in which a liquid writing medium or ink is supplied in a separate container so as to constitute a replaceable cartridge.

The present invention has as its purpose the provision of a novel and simplified pen construction adapted for mass production which assures easy and reliable replacement of the cartridge without undesirable leakage and consequent mess while at the same time providing an ink feed mechanism which insures the uniform supply of ink to the nib of the pen without danger of flooding.

In accordance with the invention, the pen section is provided with a tubular piercing extension and the feed bar is provided with a reduced diameter rearwardly extending portion formed with longitudinally extending grooves therein with the grooved extension being fitted within the tubular piercing extension so that the rearwardly extending portion of the feed bar will not interfere with the connecting and disconnecting operations whereby the cartridge may be easily and reliably replaced and so that an effective capillary feed channel is provided between the grooved portion of the exterior of the rearwardly extending portion of the feed bar and the interior of the tubular piercing extension whereby control of the ink supply and prevention of flooding is enabled.

More particularly, the pen section and its extension are constituted by a single molded piece and the feed bar and its rearwardly projecting portion are also constituted by a single molded piece and the two are simply fitted together with the nib of the pen therebetween to provide a pen assembly unit which is simply screw-propelled into the cartridge to effect a connection therebetween. More specifically, the aforesaid unit is provided with threads and the aforementioned extensions are positioned centrally thereof and the cartridge is placed within a barrel having a threaded forward end so that the unit and cartridge are connected together simultaneously with the assembling of the unit and barrel. Disassembly of the unit and barrel is not accompanied by disconnection of the unit and cartridge so that the cartridge may be extracted from the barrel to facilitate the eventual disposition thereof without undesirable mess.

An object of the invention is the provision of a writing instrument adapted to be supplied with liquid writing medium contained in a cartridge which simultaneously assures ease and reliability in the replacement of the cartridge and controlled ink supply preventing flooding.

Another object of the invention is the provision of a novel unitary pen assembly including a pen section and a feed bar which are interrelated to enable leakage free connection with a pierceable cartridge and simultaneously provide an effective and continuous capillary ink feed from the cartridge to the forward portion of the feed bar adjacent the nib of the pen.

A further object of the invention is the provision of a novel feed bar having a reduced diameter rearwardly extending portion, the feed bar being provided with at least one longitudinal groove extending continuously from the rear portion of the extension to the forward portion of the feed bar.

Still another object of the invention is the provision

of a writing instrument adapted to be supplied with liquid writing medium contained in a preferred cartridge adapted to be replaced when the liquid therein is exhausted in which the cartridge and barrel receiving the same are configured to assure proper insertion of the cartridge in the barrel.

It is also an object of the invention to provide a preformed cartridge containing means adapted to insure the capillary flow of liquid writing medium from the cartridge.

Still another object of the invention is the provision of a reservoir intermediate the capillary feed within the pen section to insure the immediate availability of writing medium after the writing instrument has been held in an inverted or carrying position.

Other and further objects of the invention will become apparent from the description which follows taken in conjunction with the accompanying drawings in which:

Fig. 1 is a longitudinal side elevation, partly in section showing a completed and assembled writing instrument constructed in accordance with the invention and showing the ink supplying cartridge positioned therein;

Fig. 2 is a top plan view of a feed bar constructed in accordance with the invention;

Fig. 3 is a section taken on the line 3—3 of Fig. 2; Fig. 4 is a rear end view of the feed bar shown in Fig. 2;

Fig. 5 is a section taken on the line 5—5 of Fig. 4; Fig. 6 is a longitudinal sectional view of a pen section constructed in accordance with the invention;

Fig. 7 is a partial side elevation, in section, and on an enlarged scale, and showing the pen section, the feed bar and the nib of the pen, which constitute a unitary assembly in accordance with the invention, the said unit being shown attached to the forward extremity of an ink supplying cartridge;

Fig. 8 is an enlarged fragmentary view in section, and illustrating the penetration of the cartridge;

Fig. 9 is a partial view, in section, and showing the rear portion of the cartridge and the rear portion of the barrel together with modified means to induce capillary flow of ink from the cartridge which is shown in inverted position.

Fig. 10 is a fragmentary top plan view of the feed bar of Fig. 2.

Referring to the drawings and more particularly to Fig. 1 thereof, the numeral 10 denotes a barrel within which is positioned an ink supply cartridge 20, with the rear of the cartridge 20 abutting a shoulder 11 formed in the interior of the barrel 10 to limit the rearward projection of the cartridge in the barrel. The exterior of the forward portion of the barrel is provided with a threaded portion 12 to which a conventional cap (not shown) can be secured and the interior of the forward portion of the barrel is provided with a threaded portion 13 to which a pen section 30 is secured by means of the external threads 31 which are formed thereon. The rear of the barrel is vented as shown at 14.

The forward end of the cartridge 20 is formed with an external outwardly extending circumferential rib 25 and the interior of the barrel 10 is formed with a shoulder 15 positioned near the forward extremity thereof. Shoulder 15 is dimensioned to permit passage of the cartridge while preventing passage of the outwardly extending rib on the cartridge. As a result, the cartridge 20 cannot be improperly inserted in the barrel 10.

Fitted within the pen section 30 is a feed bar 40 and a pen nib 50 is interposed between the pen section 30 and the feed bar 40. The side flanges of the pen nib 50 are formed with downwardly projecting portions 51, these portions 51 engaging indentations 46 in the feed bar 40 for the purpose of fixing the position of pen nib 50 with respect to the feed bar 40.

The feed bar 40 is shown more particularly in Figs. 2, 3, 4 and 5 where it will be seen that the feed bar is preferably formed of a single molded piece constituted by a forward cylindrical portion 41 and a rearwardly extending semi-cylindrical portion 42. The forward portion 41 is of conventional configuration and is shaped to define a grooved capillary channel 43 having grooves 44 therein, side flutings 45 and nib positioning indentations 46.

Referring specifically to Figs. 4 and 5, the longitudinal axis of the forward cylindrical section 41 is coaxial with the longitudinal axis of the rearwardly extending semi-cylindrical portion 42, the common axis being shown in Fig. 5 and identified by the numeral 47. The rearwardly extending semi-cylindrical portion 42 is provided with capillary grooves 48 in the non-cylindrical upper surface thereof, the capillary grooves 48 merging with the capillary grooves 44 near the intersection between the cylindrical portions 41 and 42. The merging of the capillary grooves 48 and 44 is accomplished within the cut-out portion 49 at the rear extremity of the forward cylindrical portion 41. The capillary grooves 48 slope upwardly within the cut-out portion 49 as can be best seen in Fig. 5 of the drawing.

The pen section of the writing instrument of the invention is shown in Fig. 6 from which it can be seen that the pen section 30 is symmetrically disposed about its central longitudinal axis 32. The forward portion of the pen section is of conventional construction and is identified by the numeral 33, this forward portion defining a cylindrical opening 34 the forward end of which is progressively enlarged in customary fashion. The rear of the forward portion 33 is formed of reduced diameter and this reduced section is threaded as shown at 31, the threads 31 being employed in conjunction with the threads 13 to effect the threaded securement between the pen section 30 and the barrel 10 which is shown in Figs. 1 and 8 of the drawing.

The rearmost extremity of the pen section 30 is formed with a tubular piercing extension 35, the rear extremity of which is preferably beveled, e.g. cut off at an angle, to provide an enhanced piercing action. The intermediate section of the pen section as well as the rearmost portion thereof are provided with a cylindrical bore 36 which is smaller in diameter than is the cylindrical bore 34 and communicates therewith.

As should now be evident, and as can be seen in Fig. 1 and even more clearly seen in Figs. 7 and 8, the semi-cylindrical extension 42 fits within the cylindrical bore 36 in the tubular piercing extension 35 and the forward portion 41 of the feed bar 40 fits within the cylindrical bore 34 in the forward portion 33 of the pen section 30.

Referring more particularly to Fig. 7, it will be seen that the rearwardly extending semi-cylindrical extension 42 fits within the cylindrical bore 36 with the circular exterior of the extension 42 in contact with the wall of the cylindrical bore 36 to provide an ink-feed passageway 60 between the top grooved portion 48 of the extension 42 and the interior of the cylindrical bore 36. Passageway 60 includes the space between the interior of the bore 36 and the grooved portion 48 of extension 42 and includes the grooves in said extension. This provides a grooved passageway.

Referring more particularly to the ink-supplying cartridge 20, and with reference to Fig. 8, the cartridge 20 is tubular having side walls 21 and a forward head 22 which is thickened with respect to the walls 21. The head portion 22 constitutes an annular guide and defines a guiding bore 23 at the rear end of which the forward extremity of the cartridge 20 is closed by a thin walled openable partition 24. In the preferred form shown, the partition 24 is opened by being severed by the piercing tubular extension 35 of the pen section 30 after the extension 35 has penetrated the guiding bore 23 of the cartridge 20 to an extent sufficient to provide a

sealing engagement between the cylindrical extension 35 and the interior of the annular guide 22. As will be observed, the semi-cylindrical extension 42 of the feed bar 40 does not interfere with the penetration of the partition 24 of the cartridge 20 by means of the tubular piercing extension 35 of the pen section 30. It will further be observed that as the pen section-feed bar-nib unit is threaded into the barrel 10 by means of the inter-engaging threads 13 and 31 respectively that the cartridge 20 is retained by the shoulder 11 on the barrel 10, and rotates with the unit as the same is screwed home into the barrel 10 causing the tubular piercing extension 35 to be driven through the guiding bore 23 of the cartridge 20. Thus, partition 24 is severed after the piercing extension 35 is in sealing engagement with the annular guide 22.

After the writing instrument of the invention has been assembled as aforesaid, the writing instrument is ready for writing, it being observed that a continuous capillary ink feed is provided between the interior of the cartridge 20 and the pen nib 50, this capillary feed being constituted by the grooved passageway 60, the grooved cut-out 49 and the grooved channel 43 formed in the forward cylindrical portion 41 of the feed bar 40, this latter grooved channel immediately underlying the pen nib 50 as can be seen in Fig. 7.

It is desired to point out that the cut-out 49 functions as an intermediate ink feed reservoir and insures instant writing after the pen has been maintained in an inverted or carrying position, e.g. with the nib thereof pointed upwardly. Thus, after the pen has been used for writing, the intermediate reservoir constituted by cut-out 49 is filled with liquid writing fluid which cannot return to the cartridge through the grooved capillary passageway 60 when the writing instrument is inverted.

When the writing instrument is first assembled, the passageway 60, the cut-out 49 and the capillary channel 43 are devoid of liquid writing medium and there is a tendency for the liquid writing medium in the cartridge to become air-bound therein. Additionally, there is a lesser tendency for the portions of the pen section and feed bar which extend into the cartridge to dry when the writing instrument is inverted. Again, there may be some difficulty in initiating the capillary flow of liquid writing medium from the cartridge. As previously indicated, the presence of the intermediate reservoir constituted by cut-out 49 material reduces this last named difficulty since some writing medium is immediately available and time is provided (and also writing agitation) for the establishment of capillary flow.

In any event, it is desirable, though not essential, to provide means within the cartridge to establish a capillary continuity between the portions of the feed bar and pen section which protrude into the cartridge and the liquid writing medium contained therewithin.

For this purpose a movable member having a density greater than the writing medium is positioned within the cartridge before the rear end thereof is capped to seal the writing medium therewithin. Naturally, the movable member is constructed of a material which is not subject to ink corrosion.

Referring to Fig. 1, a wire member 70 is slidably mounted within the cartridge, the member 70 having a straight central portion and ring-like forward and rear extremities. In Fig. 1, the writing instrument is inverted and the wire member 70 is in an inoperative position. The wire may be of metal or plastic.

Referring to Fig. 9, the movable means is constituted by the ball or sphere 71. When the writing instrument is placed in writing position, the sphere 71 sinks in the writing medium and contacts the protruding portions of the feed bar and pen section to initiate capillary flow of writing medium from the cartridge.

When the cartridge has become exhausted through use, the pen section 30 can be grasped and unscrewed from

the barrel 10. It will be observed that as the pen section 30 is rotated, the cartridge 20 will remain secured to the tubular piercing extension 35 and will rotate with the pen section 30 until the pen section 30 with the attached cartridge 20 is freed from the barrel 10 at which time the cartridge 20 can be extracted from the barrel 10 by the simple operation of withdrawing the freed pen section 30 from the forward end of the barrel 10. The pen section 30 with the cartridge 20 secured thereto can then be removed to a convenient location where the cartridge 20 can be withdrawn from the tubular piercing extension 35 and disposed of without any danger of soilage.

When the exhausted cartridge unit is disposed of, a fresh cartridge 20 is inserted in the barrel 10 and the pen section unit screwed home upon the barrel as previously described to enable the writing operation to continue.

To specifically illustrate a preferred construction, but without any intention of limiting the invention, the rear portion 42 of the feed bar 40 can have a length of 0.407" and a diameter of 0.090". The distance between the bottom of the rearwardly extending portion 42 and the non-cylindrical upper surface is 0.062"-0.065" and the grooves 48 therein have a width of 0.010" and a depth of 0.030". The grooves 48 widen at the forward extremity 48' of the portion 42 to a width of 0.015". The grooves 44 in the cut-out 49 have a width of 0.015" and a depth of 0.030" (the same as the depth of the grooves 48).

The slope of the bottom wall of the cut-out 49 is 15 degrees and the capillary channel 43 has a width of 0.053" and a depth of 0.018" and the grooves therein have a width of 0.015" and a depth of 0.010".

The rearwardly extending portion 42 of the feed bar 40 is disposed within the bore 36 of the pen section 30. This bore 36 has a diameter of 0.093"-0.094" and a total length of 0.469". The external diameter of the piercing extension 35 of the pen section 30 is 0.139"-0.140" and a length of 0.050". The rear of the piercing extension 35 is beveled at an angle of 25 degrees.

Throughout the specification and claims the word "cylindrical" is used in the normal sense meaning a "circular cylinder." It is also apparent from the illustrative relative dimensions given above that the portion 42 is not precisely a semi-cylinder since its diameter is 0.090" and the distance between the bottom and the upper surface is 0.062"-0.065" or more than half the diameter. Therefore, the terms "semi-cylinder" and "semi-cylindrical" are used in a loose sense meaning a longitudinal portion of a circular cylinder having a circular or cylindrical surface and a non-cylindrical surface.

As can be seen from the above illustration, it is preferred to form the grooves 48 in the rearwardly extending portion 42 so that these grooves are narrower and deeper than the longitudinal grooves in the capillary channel 43. As a result, there is a reduced tendency to lose liquid writing medium from the intermediate reservoir constituted by cut-out 49 when the writing instrument is inverted. Moreover, flow of liquid writing medium is controlled by the narrow and deep grooves 48 and prevention of flooding is further insured.

It will be appreciated that the present invention is in no way dependent upon the particular manner in which the pen nib 50 is fixed with respect to the feed bar 40 or upon the manner in which the feed bar is positioned with respect to the pen section 30.

It is desired to point out that the specific construction disclosed in the accompanying drawings is simply illustrative and many variations will be immediately apparent to those skilled in the art. To illustrate, the mounting of the nib 50 with respect to the feed bar 40 and the forward end of the pen section 30 is subject to considerable variation. For example, lugs 51 and recesses 46 may be eliminated and the pen nib may be fixed to the feed bar in other known manners, or not fixedly positioned with respect thereto. Further, the feed bar 40 is shown as

being mounted in the pen section 30 in a manner permitting rotation of the feed bar. This is not at all necessary and these parts may be constructed in a manner requiring a particular position of the feed bar with respect to the pen section. Also, the pen section may be provided with a hood projecting from the lower end of the bushing. The pen nib may also be provided with a guard. Many other similar variations will also be evident to those skilled in the art.

We claim:

1. A unitary pen assembly adapted for use in a writing instrument utilizing a replaceable liquid writing fluid containing cartridge as the source of writing medium comprising a pen section having a forward portion of enlarged diameter having a large diameter feed bar receiving bore therethrough, said pen section having a reduced diameter rearwardly extending tubular extension positioned at the rear of said forward portion, said tubular extension having a small diameter bore therethrough communicating with said feed bar receiving bore and extending through said extension to the rear face thereof to provide said extension with an open rear face, a feed bar having a forward portion fitted within said feed bar receiving bore, the forward portion of said feed bar defining a capillary channel extending longitudinally thereof, said feed bar having a rearwardly extending portion of reduced diameter projecting from the rear of the forward portion of said feed bar and fitted within said tubular extension, said rearwardly extending portion extending to adjacent said open rear face, said rearwardly extending portion of said feed bar having a longitudinal surface spaced from the inner wall of said tubular extension with said surface having therein at least one longitudinal groove, said longitudinal groove and the space between the inner wall of said tubular extension and said longitudinal surface together defining a grooved longitudinal passageway, said space being substantially the only space between the inner wall of the tubular extension and the rearwardly extending portion of the feed bar, said capillary channel and said passageway being in communication with each other at the rear of the forward portion of said feed bar, and a pen nib interposed between said feed bar and said pen section adjacent said capillary channel.
2. A pen assembly as recited in claim 1 in which said tubular extension of said pen section, the bores in said pen section and the forward extending portions of said feed bar are cylindrical, and the rearwardly extending portion of said feed bar is semi-cylindrical.
3. A pen assembly as recited in claim 1 in which the rear of the forward portion of said feed bar defines a cut-out extending between said passageway and said capillary channel.
4. A pen assembly as recited in claim 3 in which said capillary channel and cut-out are longitudinally grooved with the grooves of said passageway, cut-out and capillary channel merging to provide a continuous grooved ink feed extending from the rear of said passageway to the forward extremity of said capillary channel the groove of said passageway being narrower and deeper than the grooves of said capillary channel.
5. A writing instrument comprising a barrel having an open forward extremity, a replaceable liquid writing fluid containing cartridge having a forward annular guide portion and an openable partition therebehind, said partition normally closing said cartridge to retain said liquid writing fluid therewithin, said cartridge being slidably positioned within said barrel with the rearward projection of the cartridge in said barrel being limited, a pen section having a forward portion of enlarged diameter having a large diameter feed bar receiving bore therethrough, said pen section being threadedly engaged with the forward extremity of said barrel, said pen section having a reduced diameter rearwardly projecting tubular extension positioned at the rear of said forward portion, said tubular extension being in sliding sealing engagement with

the interior of said forward annular guide portion, said tubular extension having a small diameter bore there-through communicating with said feed bar receiving bore and extending through said extension to the rear face thereof to provide said extension with an open rear face, a feed bar having a forward portion fitted within said feed bar receiving bore, said feed bar having a rearwardly extending portion of reduced diameter projecting from the rear of the forward portion of said feed bar and fitted within said tubular extension, said rearwardly extending portion extending to adjacent said open rear face, said feed bar defining a capillary channel extending longitudinally thereof to the rear of said rearwardly extending portion to communicate with said open rear face, and a pen nib interposed between said feed bar and said pen section adjacent said capillary channel, said tubular extension being beveled at its rearmost extremity, said bevel being positioned within said forward annular guide portion of said cartridge, said bevel defining a piercing edge so that when said pen section is moved axially toward the rear of said barrel, said piercing edge is urged toward said openable partition to pierce said partition and provide direct communication between the interior of said cartridge and said open rear face.

6. A writing instrument as recited in claim 5 in which said cartridge is provided with an external, outwardly extending rib at the forward end thereof and the interior of said barrel is formed with a shoulder positioned near the forward extremity of said barrel and dimensioned to permit passage of said cartridge and prevent passage of said ribbed forward end.

7. A writing instrument as recited in claim 5 in which movable means having a density greater than the writing medium is positioned within said cartridge to insure the capillary flow of liquid writing medium from the cartridge.

8. A writing instrument as recited in claim 7 in which said movable means is constituted by a wire member having a ring-like forward extremity.

9. A writing instrument as recited in claim 5 in which said tubular extension is centrally positioned with respect to said threaded engagement, said tubular extension and the bore therein being cylindrical, the rearwardly extending portion of said feed bar being semi-cylindrical with the non-cylindrical surface thereof having longitudinal grooves formed therein, and the rear of the forward portion of said feed bar defines an intermediate reservoir constituted by a cut-out extending between said passageway and said capillary channel, said capillary channel and said cut-out being longitudinally grooved with the grooves in said passageway, cut-out, and capillary channel merging to provide a continuous grooved ink feed, the grooves of said passageway being narrower and deeper than the grooves of said capillary channel.

10. A feed bar comprising a forward cylindrical portion provided with a longitudinally extending capillary channel comprising at least one groove, the rear of said forward portion defining a cut-out communicating with the rear termination of said capillary channel and terminating at a point on the rear face of said forward portion intermediate said capillary channel and the longitudinal axis of said forward portion, a rearwardly extending portion, integral with the forward portion, of smaller diameter than said forward portion, said rearwardly extending portion being semi-cylindrical with the non-cylindrical surface having therein at least one longitudinal capillary groove, the bottom of said cut-out being provided with at least one groove communicating with a groove in said non-cylindrical surface, the groove in said non-cylindrical surface being narrower and deeper than the groove of said capillary channel.

11. A feed bar as recited in claim 10 in which said forward portion and said rearwardly extending portion have a common longitudinal axis.

12. A unitary pen assembly as recited in claim 11 in

which said tubular extension is beveled at its rearmost extremity.

13. A unitary pen assembly adapted for use in a writing instrument utilizing a replaceable liquid writing fluid containing cartridge as the source of writing medium comprising a pen section having a forward portion of enlarged diameter having a large diameter feed bar receiving bore therethrough, said pen section having a reduced diameter rearwardly projecting tubular extension positioned at the rear of said forward portion, said tubular extension having a small diameter bore therethrough communicating with said feed bar receiving bore and extending through said extension to the rear face thereof to provide said extension with an open rear face, a feed bar having a forward portion fitted within said feed bar receiving bore, said feed bar having a rearwardly extending portion projecting from the rear of the forward portion of said feed bar and fitted within said tubular extension, said rearwardly extending portion extending to adjacent said open rearface, said feed bar defining a longitudinally extending capillary channel, said channel extending to the rear of said rearwardly extending portion of said feed bar and communicating with said open rear face, the tubular extension being beveled at its rearmost extremity to provide a piercing edge for piercing a closure on said cartridge, and a pen nib interposed between said feed bar and said pen section adjacent said capillary channel.

14. A unitary pen assembly adapted for use in a writing instrument utilizing a replaceable liquid writing fluid containing cartridge as the source of writing medium comprising a pen section having a forward portion of enlarged diameter having a large diameter feed bar receiving bore therethrough, said pen section having a reduced diameter rearwardly extending tubular extension positioned at the rear of said forward portion, said tubular extension having a small diameter bore therethrough communicating with said feed bar receiving bore and extending through said extension to the rear face thereof to provide said extension with an open rear face, a feed bar having a forward portion fitted within said feed bar receiving bore, the forward portion of said feed bar defining a capillary channel extending longitudinally thereof, said feed bar having a rearwardly extending portion of reduced diameter projecting from the rear of the forward portion of said feed bar and fitted within said tubular extension, said rearwardly extending portion extending to adjacent said open rear face, said rearwardly extending portion of said feed bar having a longitudinal surface spaced from the inner wall of said tubular extension with said surface having therein at least one longitudinal groove, said longitudinal groove and the space between the inner wall of said tubular extension and said longitudinal surface together defining a grooved longitudinal passageway, said rearwardly extending portion being of uniform cross section, said capillary channel and said passageway being in communication with each other at the rear of the forward portion of said feed bar, and a pen nib interposed between said feed bar and said pen section adjacent said capillary channel.

References Cited in the file of this patent

UNITED STATES PATENTS

55	1,724,106	Pollock	Aug. 13, 1929
	1,724,107	Pollock	Aug. 13, 1929
	1,762,554	Hume	June 10, 1930
	1,783,681	Terry	Dec. 2, 1930
	2,736,292	Tanberg	Feb. 28, 1956
70	2,748,749	Palsic	June 5, 1956

FOREIGN PATENTS

	1,071,648	France	Mar. 10, 1954
	708,633	Great Britain	May 5, 1954
75	728,188	Great Britain	Apr. 13, 1955