United States Patent [19]

Tullos

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[45] **Nov. 20, 1973**

[54] **JEWEL TIP CAPILLARY PEN**

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[22] Filed: **May 15, 1972**

[21] Appl. No.: **253,008**

[52] **U.S. Cl.** **346/140**

[51] **Int. Cl.** **G01d 15/16**

[58] **Field of Search** 346/140; 401/261-265

[56] **References Cited**

UNITED STATES PATENTS

1,179,925	4/1916	Hull	346/140
2,829,026	4/1958	Pignone	346/140
2,842,421	7/1958	Dreyfus	346/140 X
3,146,058	8/1964	Henshaw	346/140
3,150,915	9/1964	Dixon et al.	346/140
3,644,933	2/1972	Tullos et al.	346/140

FOREIGN PATENTS OR APPLICATIONS

1,149,542	5/1963	Germany	346/140

Primary Examiner—Joseph W. Hartary
Attorney—William A. Strauch et al.

[57] **ABSTRACT**

The disclosure includes several embodiments of a jewel tip for use in pen assemblies mounted on recorder arms of recorder apparatuses. The jewel tip is inserted into the writing end of a capillary pen tip, and, in one embodiment, may have its end protruding to act as the writing tip, or, in another embodiment, may be inset into the capillary pen tip.

In either case, the jewel tip serves two purposes, one being to act as a plug to prevent drying of ink in the capillary pen tube and the other being to feed ink to a writing surface at a constant steady rate to assure an uninterrupted line on the writing surface.

5 Claims, 7 Drawing Figures

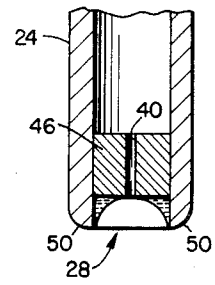
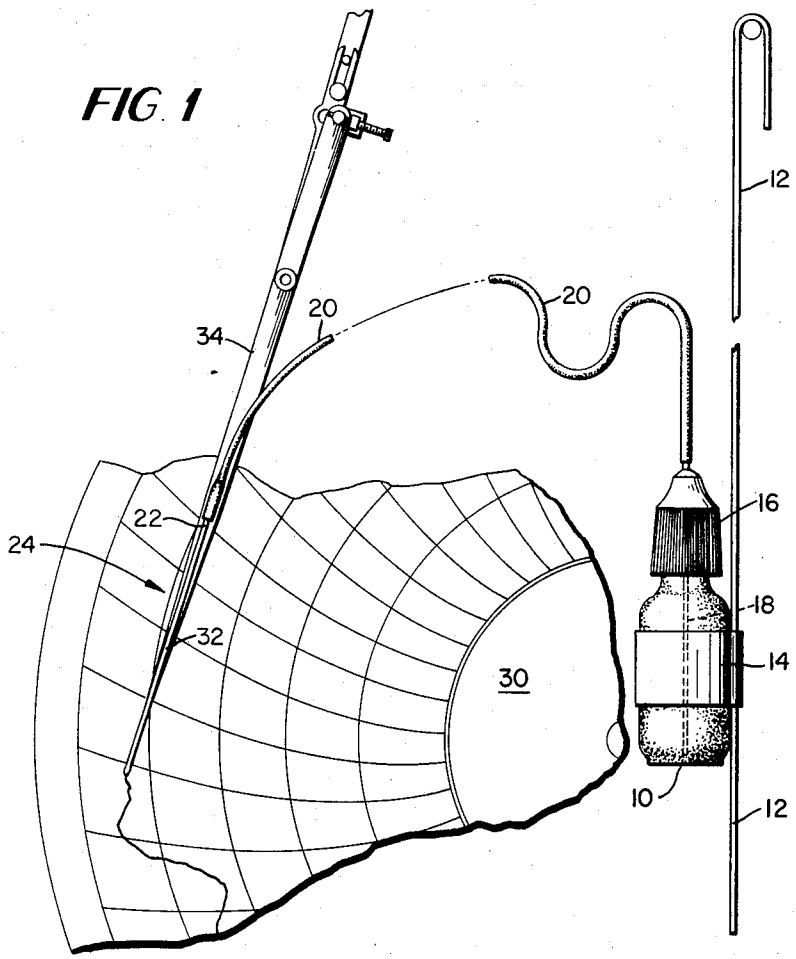


FIG. 1



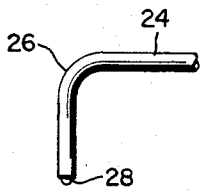


FIG. 3

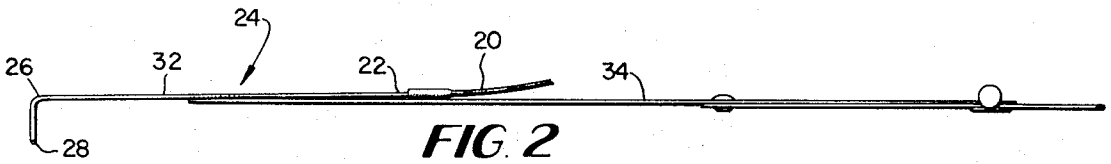


FIG. 2

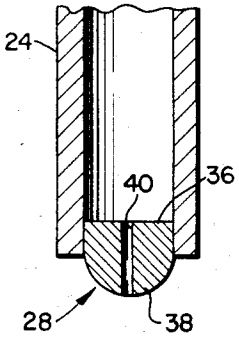


FIG. 4

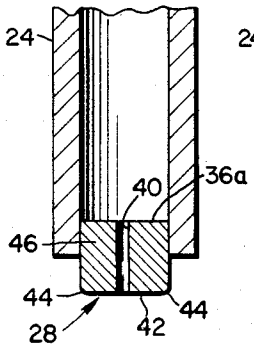


FIG. 5

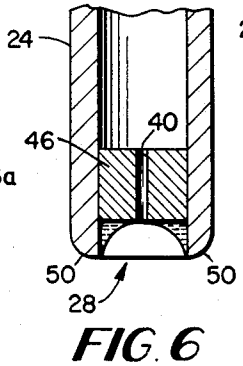


FIG. 6

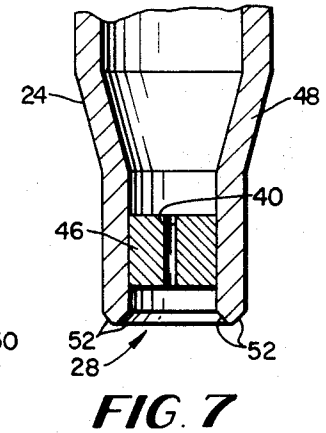


FIG. 7

JEWEL TIP CAPILLARY PEN

CROSS REFERENCE TO RELATED PATENTS

Capillary pen systems in and with which the present invention may be used are disclosed in U.S. Pat. No. 3,644,933 issued Feb. 22, 1972 for Reservoir Type Inking Pen Systems and U.S. Pat. No. 3,653,070 issued Mar. 28, 1972 for Nested Sleeve Recording Pen Head.

BACKGROUND OF THE INVENTION

The invention is designed for use in a capillary ink feed system for drawing extremely fine, unbroken uniform width lines on stationary or driven charts such as timed movement drum or circular recording charts found in a wide variety of recorder apparatuses. Typically, the pen assembly and the capillary ink feed system include a capillary pen tube connected to an ink supply via a very thin flexible capillary pen tube, and the free end of the pen tube may either having a writing pen tip inserted into a chamber mounted at the pen tube free end, such as is disclosed in the two prior patents mentioned above, or the pen tube free end itself may be drawn to a fine diameter writing point.

This latter structure provides an easily formed, low cost writing tip, but even though such pen tubes with integral writing tips are formed from stainless steel, the writing tips tend to wear rather easily, and ink has a tendency to dry up and clog the fine passageway in the pen tube when not in use.

Problems of writing tip life and ink blockage have been dealt with by various prior art proposals, as exemplified in U. S. Pat. No. 2,600,426, issued June 17, 1952 and in French Pat. No. 1,243,524 granted Sept. 5, 1960. In the U. S. Patent, a jewel tip for a capillary fountain pen is disclosed which imparts a smooth tip and long wear life in such a pen, but no mention is made of the problem or nor is there any teaching of a solution for ink drying and blocking the primary ink passageway. In fact, the interior diameter of the jewel tip is disclosed as being the same as the interior diameter of the remainder of the pen writing point. The French patent overcomes the ink blockage problem by insertion of a writing tip into the usual writing tip end of a pen tube, but the tip disclosed is not a jewel tip. In fact, its teaching is that the inserted tip must be made of sintered metal, polytetrafluoroethylene flock, stacked leaves, or a multichanneled block so that multiple microcapillary passages for ink flow will be provided from the pen tube to the writing tip of the pen.

The present invention provides a jewel tip which may function as a block only, to prevent ink drying within the pen tube, or as a block and writing tip as well. The jewel insert, is made with but a single microcapillary passageway concentric to the pen tube so that uniform ink flow is assured as ink drying within the pen tube is prevented.

SUMMARY OF THE INVENTION

A primary object of the invention resides in the provision of a jewel insert having a single microcapillary passageway for a pen tube of a capillary pen system to serve as a plug, to prevent ink drying within the pen tube, and as a flow control means, to assure an uninterrupted, uniform width line on the writing surface contacted by the pen.

Another object of the invention is to provide a jewel insert for capillary pen tube, functioning as a plug and as an ink flow control, the lower end of which may extend from the pen tube as a pen writing tip.

It is a further object of the invention to provide a capillary pen tube jewel insert which may be contoured to a smooth writing tip to produce a fine, even line on the surface being written upon.

Yet another object of the invention to provide a capillary pen tube jewel insert which may be contoured to a smooth writing tip to produce a fine, even line on the surface being written upon.

Further novel features and other objects of this invention will become apparent from the following detailed description, discussion and the appended claims taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

Preferred structural embodiments of this invention are disclosed in the accompanying drawings in which:

FIG. 1 is a partial diagrammatic view illustrating a typical capillary inking pen system of a recorder apparatus;

FIG. 2 is a side elevational view of the recorder arm and pen assembly shown in FIG. 1 with a jewel writing tip insert in the pen tube thereof;

FIG. 3 is a partial elevational view of the pen tube and jewel tip insert as shown in FIG. 2, drawn to an enlarged scale;

FIGS. 4 and 5 are partial sectional views illustrating two embodiments of a jewel insert used as a pen tube plug and writing tip; and

FIGS. 6 and 7 are partial sectional views showing a jewel insert used as a pen tube plug only.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates an inking pen system having an ink supply in the form of a bottle **10** retained on a steel wire hanger **12** by an encircling steel band or clip **14**. Bottle **10** is preferably made of resilient plastic and is vertically selectively positionable along the length of hanger **12** to assure proper ink flow. A stopper **16** on bottle **10** supports a vertically oriented stinger **18**, inserted through stopper **16** into the bottle **10**, and a length of fine diameter flexible plastic capillary tubing **20** serves as a conduit for ink from stinger **18** to end **22** of a pen **24**. A 90° bend is formed in pen **24** and **26** to properly vertically orient the writing tip **28** of pen **24** over a circular chart **30**. The main body **32** of pen **24** is silver soldered or otherwise suitably secured to recorder arm **34** of a circular chart recorder (not shown) which rotates chart **30** by a timed drive to produce a timed recording in conjunction with sweep movement of recorder arm **34**, which is induced by some condition being recorded.

Both stinger **18** and the pen **24** are made of capillary dimension stainless steel tubing, while plastic conduit tubing **20** is made of capillary dimension plastic tubue. In a preferred embodiment, the steel tubing has an O.D. on the order 0.0344 inch and an I.D. of about 0.023 inch; plastic tubing **20** may be made of "Tygon" plastic with an O.D. of 0.059 inch and an I.D. of 0.028 inch. In each case, dimensions are not critical.

Referring now to FIGS. **4** through **7**, several embodiments of jewel tip inserts are disclosed for the writing tip **28** of pen **24**. Jewel insert tip **36** (FIG. **4**) is semispherically rounded at **38** to present as smooth a contact point as possible to the paper or chart being recorded.

Jewel insert tip **36** is snugly press fit into writing tip **28** but may be secured in place by anyone of a number of means (e.g., epoxy cement). A single microcapillary passageway **40** is formed concentrically within jewel insert tip **36** to communicate ink from the capillary passageway in pen **24** above jewel insert tip **36** to the paper or chart **30** being recorded. In a preferred embodiment, the diameter of single microcapillary passageway **40** will be on the order of 0.0033 inch ±.

The embodiment illustrated in FIG. **5** is similar to FIG. 4 in that the jewel insert tip **36***a* is mounted in an extended fashion to serve as a writing tip, but **36***a* is blunt ended at **42** rather than rounded. The lower circumferential edge **44** of jewel insert tip **36***a* is slightly rounded to minimize the possibility of marring or tearing the paper or chart **30** being recorded.

The advantages of a jewel insert tip are at least twofold. First, the insert **36** or **36***a* serves as a plug to prevent air from entering the main capillary passageway of pen **24** which would dry the ink therein and create a block, at least causing ink skipping on the paper or chart **30** or more likely preventing pen **24** from recording at all. Unlike prior art device such as the French Patent No. 1,243,524 discussed above, disclosing an insert having multiple microcapillary passageways to convey ink to the paper, it has been found that but a single microcapillary passageway **40** is sufficient to convey ink to the paper. Additionally, the provision of but a single microcapillary passageway **40** in place of multiple microcapillary passageways, greatly reduces the possibility of air entering the main capillary passageway of pen **24** and creating an ink block.

In the embodiment shown in FIG. **6**, a retracted jewel insert tip **46** is disclosed, having a concentric, vertically oriented microcapillary passagewy **40**, and is disposed only slightly above writing tip **28** so as to serve as an ink plug very closely adjacent the writing tip **28**. Preferably jewel insert tip **46** disposed coincident with a horizontal tangent through the apex of the normal inverse (concave) meniscus of ink which will form at the tip when the pen is not writing. Thus, an annular ring of ink will remain about the junction of jewel insert tip **46** and writing tip **28**, but none will be located at the base of microcapillary passageway **40** to possibly create an ink block.

The jewel tip insert **46** illustrated in FIG. **7** is similar in all respects to the insert **46** shown in FIG. **6**. In this embodiment, writing tip **28** is drawn into a smaller capillary diameter at its writing end **48**. Tip **28** is exteriorally rounded only, at **50** in the embodiment shown in FIG. **6**, while the tip **28** is both internally and externally rounded at **52** in the embodiment shown in FIG. **7**. In both cases, this finishing treatment provides a very smooth tip which will not rip or tear the paper or chart **30** being recorded.

In each embodiment shown, the jewel has been a ruby primarily because rubies are readily commercially available and inexpensive and have the desired smoothness and hardness qualities suitable for this invention. However, any hard, long wearing, smooth mineral or synthetic material may be used, e.g., sapphire, diamond, glass or carborundum.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to secured by Letters Patent is:

1. In a capillary inking pen system for use with recording apparatus including an ink supply and ink conduit means from the ink supply, an improved writing pen construction comprising: a stainless steel capillary pen tube in fluid communication with the ink conduit means, a pen tip formed on the lower end of said pen tube, a jewel insert spigotted up into the end of said pen tip so that it is disposed entirely within said pen tip, out of contact with a surface being written upon, said jewel insert being disposed so that its lower terminal end is located coincident with the apex of a concave meniscus of ink at the lower end of said pen tip, and means defining a single microcapillary passageway through said jewel insert for communicating ink from the writing pen to a point beneath said jewel insert and above the surface being written upon, whereby said jewel insert acts as a plug to minimize the entrance of air into the main body of the writing pen while providing said single microcapillary passageway, being of sufficient diameter to communicate ink from the writing pen main body to said point above the surface being written upon.

2. The improved writing pen construction as recited in claim **1** wherein said microcapillary passageway is formed vertically within said insert, concentrically with respect to the side walls of said pen tip.

3. The improved writing pen construction as recited in claim **2** wherein said jewel insert comprises a ruby.

4. The improved writing pen construction as recited in claim **1** wherein said pen tip is drawn into a smaller capillary diameter pen tip end, said jewel insert being located within said smaller capillary diameter end.

5. The improved writing pen construction as recited in claim **1** wherein the diameter of said microcapillary passageway is on the order of 0.0033 inch.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,774,231 Dated Nov. 20, 1973

Inventor(s) Aubrey R. Tullos

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 37, change "or" to --of--.

Column 2, line 7, after "invention" insert --is--.

Column 2, line 57, change "tubue" to --tubing--.

Column 3, line 12, after "but" insert --tip--.

Column 3, line 35, correct the spelling of --passageway--.

Column 3, line 38, after "46" insert --is--.

Column 3, line 49, after "end" insert --,at--.

Signed and sealed this 9th day of April 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

ORM PO-1050 (10-69)

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* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334

UNITED STATES PATENT OFFICE
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