

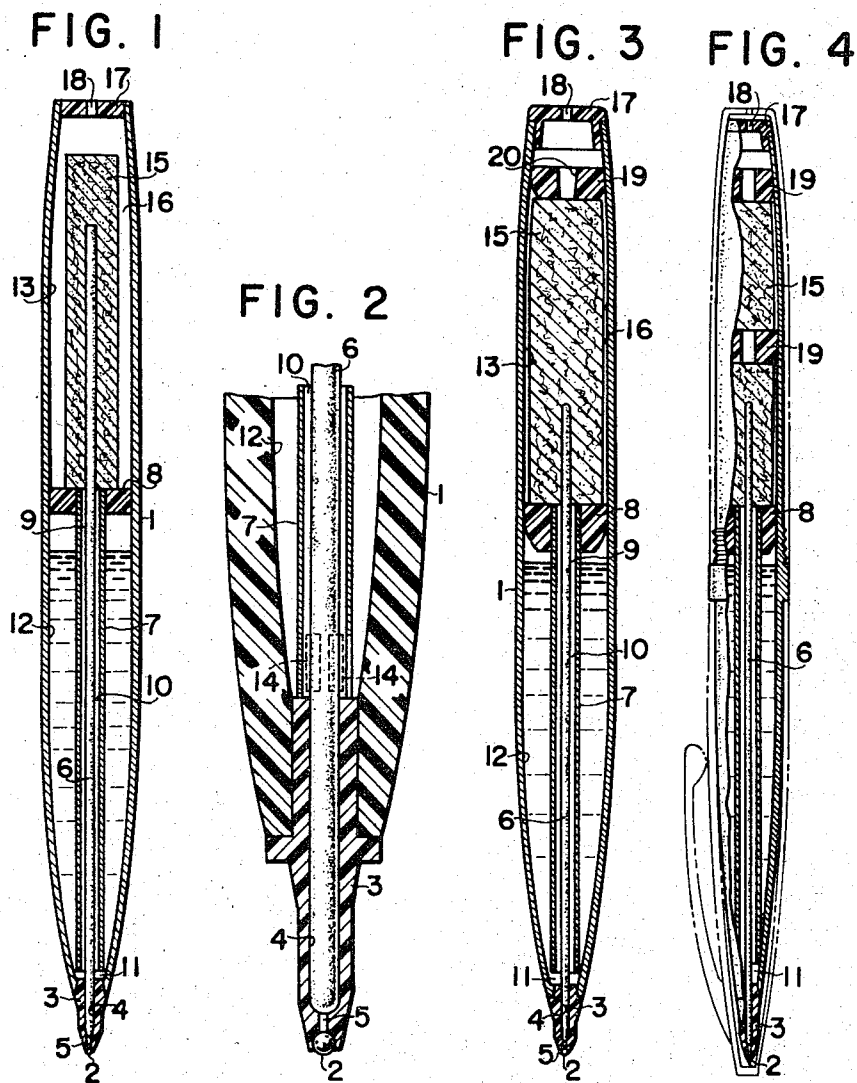
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BALL POINT PEN FOR WATER SOLUBLE INK

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3,533,708

BALL POINT PEN FOR WATER SOLUBLE INK
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8 Claims

ABSTRACT OF THE DISCLOSURE

A ball point pen for water soluble ink is provided which comprises a tubular pen body divided into two chambers by a bulkhead which has a hole therethrough. The first chamber for ink reservoir contains an elongated tube suspended from the hole of the bulkhead and a capillary core held within the back end of a nib holder and extending through the tube into the second chamber. The second chamber contains an ink absorbent material surrounding the core in contact therewith and is communicated with atmosphere through a vent hole provided in the second chamber. A rollable ball point is positioned in the front end of said nib holder.

This invention relates to a ball point pen for use with water soluble ink. The viscosity of water soluble ink is generally less than the viscosity of normal ink. Thus the viscosity of water soluble ink may be influenced by the temperature of the surrounding atmosphere and also any air within an ink chamber of a pen may expand as the temperature of the atmosphere rises so that blotting or flooding of the ink in the pen may result.

For conventional fountain pens various methods for preventing flooding have been used. However, improved methods or constructions for preventing flooding have been directed only to constructions which absorb and store excess fluid ink at a part of the pen adjacent the front end of the hollow casing of the pen and this construction has the disadvantage that it is complex.

An object of this invention is to provide a ball point pen capable of writing smoothly without skipping or blotting.

According to this invention, a ball point is rotatably and tightly held in the front end of a nib holder secured to one end of a hollow casing. An elongated core for carrying ink is secured at one end thereof to the rear end thereof to the inner portion of the hollow casing. The core is inserted through an elongated tube, forming a narrow clearance between them. The elongated tube is at the rear end thereof engaged within a hole of a bulkhead provided at the middle portion of the casing. The bulkhead made of resilient material divides the hollow casing into two chambers. The first chamber stores the water soluble ink to carry the ink toward the ball point through the core. An absorbent material for excess ink is contained in the second chamber in contact with the rear end of the core. The second chamber is communicated with the atmosphere through a vent hole thereof.

The advantages of a pen according to this invention are that any suction effects in the ink chamber are avoided. The excess ink chamber communicating with the atmosphere is always linked with the ink chamber through the elongated tube. There is substantially no danger of ink leakage and skipping. Moreover, when the air within the ink chamber expands, with a resultant increase in liquid pressure within the ink chamber it is possible to store excess ink by means of the excess ink absorbent. The resistance to flow of ink reaching the excess ink chamber

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by way of the clearance between the interior wall surface of the elongated tube and the inner core being inserted therein, is less than the resistance to flow of the ink which reaches the ball point which is held at the forward end of a nib holder along the inner core. Typically the inner core is between 1.57 to 1.61 mm. in diameter. A preferred clearance between the inner diameter of the elongated tube and the outer diameter of the inner core is from 0.10 to 0.15 mm. Skipping of ink is due to insufficient air ventilation caused by the clearance being too small. On the other hand, if the said clearance is more than 0.15 mm., then the ink tends to leak or blot.

The excess ink absorbent is of a continuous porous material or felt. The surface of the excess ink absorbent can be treated with a repellent material such as oil or silicone resin, to maintain enough clearance for storing a fluid ink.

However, the surface of the excess ink absorbent is treated so as not to store more ink than its saturating capacity.

A resilient bulkhead can be used to prevent ink leakage from a vent hole along an interior wall of the excess ink chamber. Alternatively, two excess ink absorbents can be fixed in the interior of the casing by three resilient bulkheads.

The invention will now be described with reference to the accompanying drawing,

FIG. 1 is a longitudinal cross-section of a first embodiment of ball point pen,

FIG. 2 is a longitudinal cross-section of part of a second embodiment of ball point pen, and

FIGS. 3 and 4 are views similar to FIG. 1, but showing third and fourth embodiments, respectively, of ball point pen.

In FIG. 1, there is shown a nib holder 3 having a ball point 2 snugly and rotatably held at a front end of a hollow casing 1. It is similar to the nib holder construction of the well-known type ball point pen in that there is provided a relatively large central opening 4 and a smaller ink leading aperture 5.

In the central opening 4 of the nib holder 3, a slender ink leading core 6 extending inwardly of said hollow casing 1 is located. This ink leading core 6 is moulded in the form of a rod and is treated with a thermoplastic synthetic resin, thermo-setting synthetic resin and or their mixture to form capillaries in the longitudinal direction of the rod.

A middle bulkhead is made of flexible resilient plastics material. A central bore hole 9 is provided at the central portion of the middle bulkhead 8 so that an elongated tube 7 can be inserted snugly into the bore hole 9. The inner diameter of the elongated tube 7 should be such that an annular clearance is formed when the ink leading core 6 is inserted therein. The elongated tube 7 is supported and inserted into the bore hole 9 of the bulkhead so as to fit snugly at the middle portion of inner wall of the hollow casing 1.

An inflow hole 11 for venting a fluid ink is formed between the rear end of nib holder 3 and the forward end of the elongated tube 7. Alternatively, the inflow hole 11 can be in contact with said rear end tube 7 and with the rear end of nib holder 3, as shown in FIG. 2, after a plurality of slots 14 have been provided at the forward end of tube 7.

The forward end of ink leading core 6 extends towards the inside of an excess ink chamber 13 and engages with an excess ink absorbent 15 of cotton, the surface of which has been coated with a silicone oil or resin. Because a space is formed surrounding the excess ink absorbent 15 (as shown by reference numeral 16 in the drawings) when the ink absorbent 15 is placed within the excess ink chamber 13 the ink is in contact with the atmosphere

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via a vent hole 18. In the embodiment shown in FIG. 3, the excess ink absorbent is placed between a bulkhead 19, having a vent hole 20 at the central portion and the middle bulkhead 8. In the embodiment illustrated in FIG. 4, two excess ink absorbents 15 are mounted and sandwiched by resilient bulkhead 19, respectively.

The air vent hole linking the excess ink chamber 13 with the atmosphere is at the central portion of a plug 17. In all cases, the plug 17 is fitted flush to the rear end of the hollow casing.

It should be noted that a screw-thread is provided on the circumferential surface of the hollow casing as shown in the embodiment in FIG. 4 and is screwed to a hollow capsule made of metal or metal-like material. Moreover, a front end of hollow casing 1 is removably covered with a cap.

As described, it should be understood that the ink chamber 12 communicates with the outside atmosphere through the annular clearance 10, and also any excess ink which may cause ink leakage is retained in the ink absorbent 15.

I claim:

1. A ball point pen for water soluble ink, said pen comprising a tubular pen body having an opening; a tubular nib holder having front and back ends and being secured in the opening of the pen body; a rollable ball point positioned and held in the front end of said nib holder; a capillary core held within the back end of the said nib holder to furnish ink to said ball point; an ink impermeable separator within said pen body forming an ink reservoir within said body, said separator also forming a second chamber, said separator having a single hole therethrough; an ink absorbent material positioned within said second chamber and in contact with said core; and a tube positioned in the hole of said separator and substantially sealing said hole except for its tube bore, said tube protruding into said ink reservoir, said tube surrounding a portion of said core and said tube permitting a small ink passage between the tube and the core so that

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a limited amount of ink may flow from said reservoir to said absorbent material.

2. A ball point pen as in claim 1 wherein said separator is of a resilient plastic resin.

3. A ball point pen as in claim 1 wherein said body portion has a second opening partly closed by a plug having an air vent.

4. A ball point pen as claimed in claim 1 wherein the annular clearance between the core and the tube is from 0.10 to 0.15 mm. in diameter.

5. A ball point pen as claimed in claim 1 wherein the absorbent material has a partial coating of silicon oil.

6. A ball point pen as claimed in claim 1 further comprising a second separator within said body, said second separator having a vent hole and being positioned, within the said first separator, to sandwich said absorbent material.

7. A ball point pen as claimed in claim 6 further comprising a second excess ink absorbent material placed on said second separator and being sandwiched with a third separator having an air vent hole therein.

8. A ball point pen as claimed in claim 1, wherein said tube is provided with a plurality of slots and is in contact with the rear end of said nib holder.

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LAWRENCE CHARLES, Primary Examiner

U.S. Cl. X.R.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,533,708 Dated October 13, 1970

Inventor(s) Yukio Horie

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 51 - before "thereof", -- of the
nib holder and extends at the
other end -- has been inserted;

Column 1, line 55 - "bulkhear" has been changed to
-- bulkhead --

SIGNED AND
SEALED
DEC 15 1970

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents