

[54] VENTING DEVICE FOR STYLOGRAPHIC PENS

401/250, 236, 237

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Related U.S. Application Data

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[52] U.S. Cl. 401/258

[51] Int. Cl. B43k 8/00

[58] Field of Search 401/258-260,

[56]

References Cited

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Primary Examiner—Lawrence Charles

[57]

ABSTRACT

A vent system for a tube writing pen wherein the vent consists of a longitudinally adjustable threaded stem extending within the writing fluid reservoir and venting at varying depths within the writing fluid. The upper end of the stem is open to atmospheric pressure through a venting channel defined in the pen housing.

4 Claims, 4 Drawing Figures

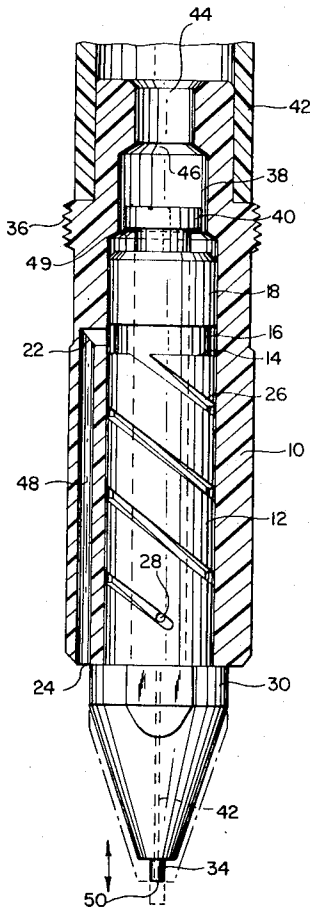


FIG. 1

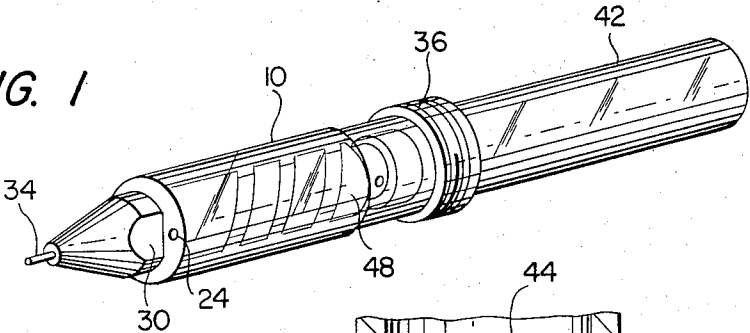


FIG. 2

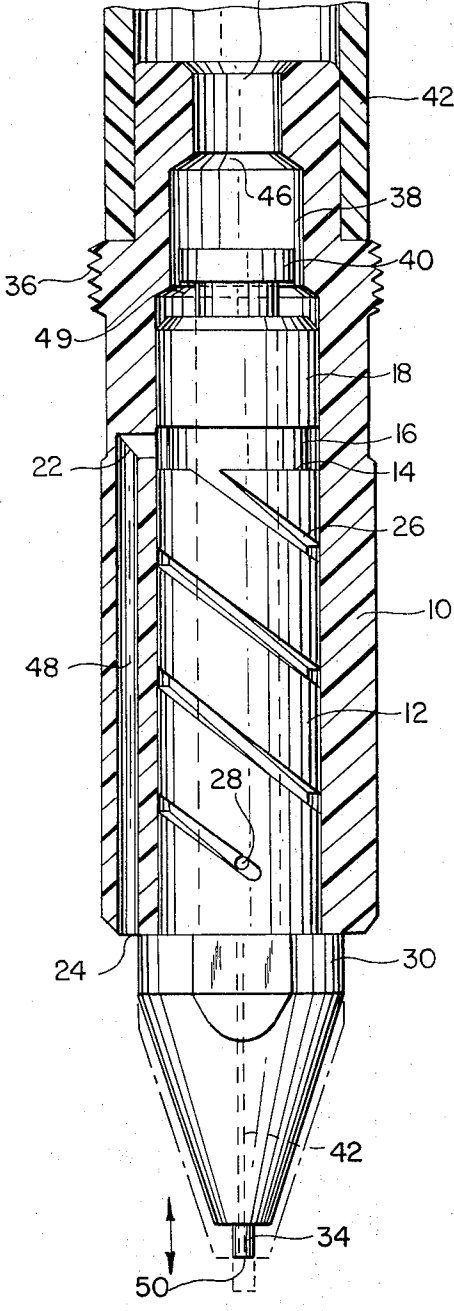


FIG. 3

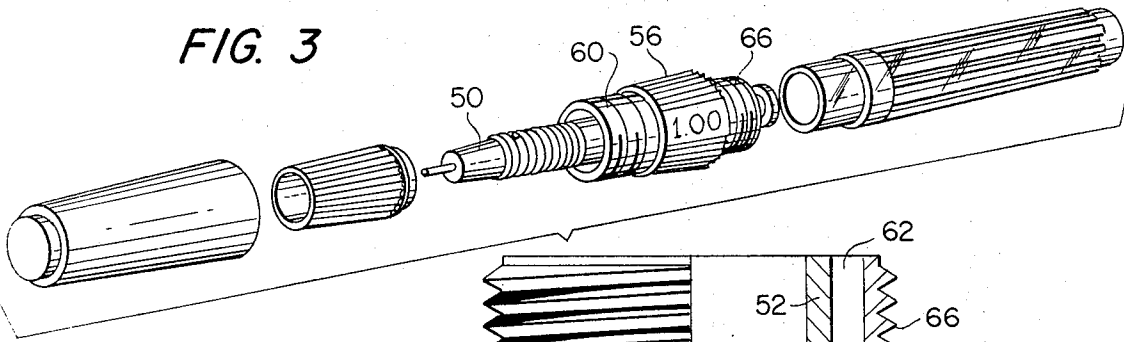
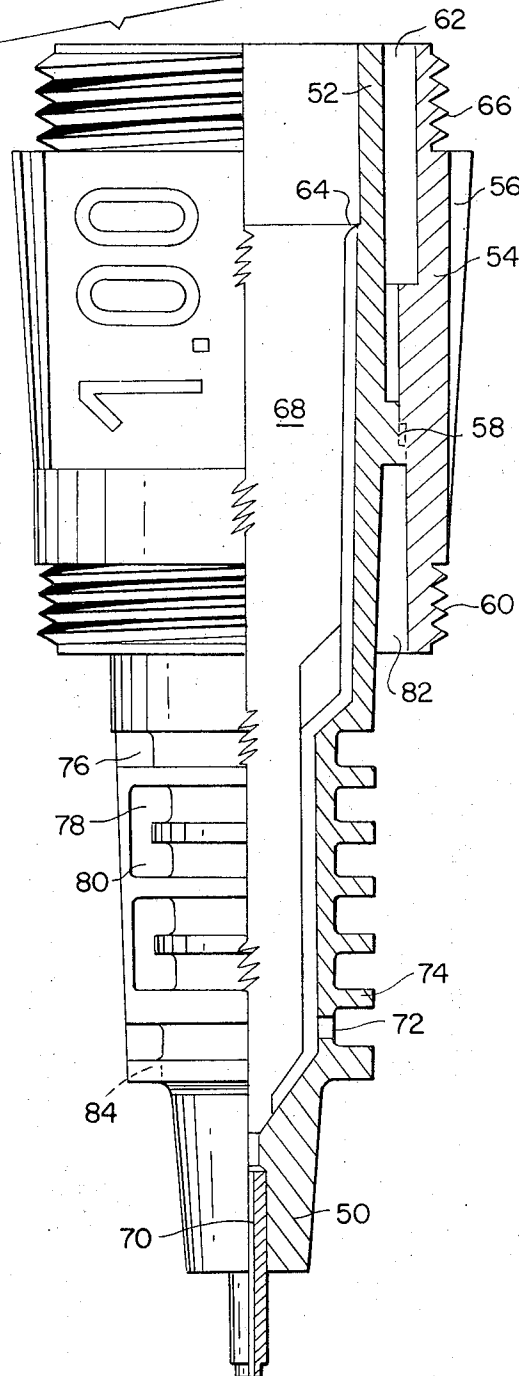


FIG. 4



VENTING DEVICE FOR STYLOGRAPHIC PENS

CROSS-REFERENCES TO RELATED APPLICATIONS:

A continuation in part of applicant's METHOD OF VENTING A STYLOGRAPHIC PEN (Ser. No. 185,020, filed Sept. 30, 1971 issued as U.S. Pat. No. 3,741,668). The present application is directed to a modified structure, involving a simplification of parts.

BACKGROUND OF THE INVENTION

Field of the Invention

It is common to vent stylographic writing pens through a spiral venting channel which is built into the nib. This venting channel communicates with the main ink reservoir via a hole in the upper end of the spiral venting channel. The spiral venting channel is normally cut into the same surface that also carries the tightly pitched screw threads which are provided for screwing the writing head into the body of the writing pen. This conventional arrangement has several consequences such as (a) two intersecting threads of different pitch, namely, the spiral venting channel and the screw thread must be cut into the nib, necessitating these additional production steps; and (b) the relatively short venting channel communicates with the outside air which may cause, even with the slightest neglect, the air to dry and block the venting channel, necessitating unscrewing the nib frequently for cleaning.

SUMMARY OF THE INVENTION

According to the present invention, the venting stem is axially reciprocable within the pen housing which has a lateral venting channel extending through its side. The venting stem has an helical channel defined upon its exterior and a venting channel extending radially inwardly from the bottom of the helix into its interior chamber. The cleaning wire and lead weight are freely supported within the interior chamber. The ink reservoir is mounted atop the housing such that the ink flows downwardly into the interior chamber and thence outwardly of the pen through the tubular writing point.

As defined in the parent application, the rate of flow of the ink may be regulated by varying the positioning of the vent stem with respect to the lower end of the writing point and according to the following formula:

$$F = lg \times - 2\gamma/r_A$$

F = magnitude of the hydrostatic head

l = density of the writing fluid

g = acceleration due to gravity 980 cm/sec.

r_A = radius of vent stem bottom tip

$\times$ = distance between vent stem bottom tip and the lower end of the writing point.

γ = surface tension of writing fluid.

BRIEF DESCRIPTION OF THE DRAWINGS:

FIG. 1 is a perspective view of the pen housing supporting the tubular writing tip at one end and the ink reservoir at the other end; and

FIG. 2 is a vertical elevation, partially in section showing the venting channel extending through the side of the lower housing so as to communicate with the

venting helix and radial channel in the reciprocable venting stem.

FIG. 3 is a vertical section, correction vertical elevation, partially in section, of a modified form of the invention; and

FIG. 4 is an exploded view of a portion of the embodiment of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS:

In FIG. 1 there is illustrated a lower pen housing 10, supporting a writing nib 30 through which extends tubular writing point 34. At the upper end of the housing ink reservoir 42 may be fitted upon a laterally extending shoulder 36.

Lower housing venting channel 48 is defined in the sides of the housing so as to communicate with helical venting channel 14 inscribed in the exterior.

In FIG. 2 the lower pen housing 10 is more particularly illustrated as reciprocably supporting venting stem 12 having an open top 18, a helical venting channel 14 communicating with helix 26 and a radially inwardly extending venting channel 28 which extends into the hollow interior of stem 12. A conventional weight 40 and cleaning wire 42 (illustrated in FIG. 2.) fits removably within the stem such that the cleaning wire 42 extends into the tubular writing point 34 which is secured in the conical writing nib 30. Housing 10 embodies upper peripheral shoulders 36 upon which a plastic or similar reservoir enclosure 42 may be fitted. An inner housing shoulder limits vertical upward movement of the venting stem and an inner shoulder 46 may be employed to limit upward movement of weight 40. Venting channel 48 in housing 10 leads from inlet 24 to lateral conduit 22 which communicates with lateral recess 14 such that the atmosphere is vented into the helix 26 and thence into the supply of ink which flows through upper opening 44 past the weight 40 and into the interior of venting stem.

As set forth in the parent application, the present venting system enables control of the hydrostatic head at the writing tip end 34. By increasing the magnitude of the hydrostatic head, the rate of ink flow can be regulated with greater accuracy for increased writing speeds than have been possible with conventional pens. This is of manifest importance in computerized drafting where high speeds of writing are required.

As set forth in the parent application, applicant is able to define the hydrostatic head of the writing fluid at the point of contact with the writing media in terms of the physical parameters of the pen and the physical properties of the writing fluid. Thus, the magnitude of the total hydrostatic head determines with a high degree of accuracy the velocity of flow of the writing fluid. The important practical consequence of the above is the prevention of the spontaneous formation of drops at the lower end of the writing tube. This construction provides for close control of ink flow independently of the amount of writing fluid in the reservoir, so long as the bottom end of venting channel 28 is immersed within the writing fluid. Applicant controls the distance from the bottom end of channel 28 to the lower tip of the writing tube and thereby the radius of curvature of the bubble 50 at the end of the writing tube.

In FIGS. 3 and 4 there is illustrated a modified form of the invention wherein venting stem 50 supporting

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tubular writing tip 34 has a longitudinally extending upper body 52 and adjacent the nib a lateral venting channel 72 communicating with the ink-filled interior.

A plastic or like collar 54 having longitudinally threads or engraving 56, as well as upper horizontal threads 66 and lower horizontal thread 60, may be snap-fitted as to 58 to the exterior of body 52, defining at its upper end recess 62 for the support of an ink reservoir (not illustrated) and defining at its lower end recess 82 for supporting venting channel cover piece 82.

Within the top interior of body 52 there is defined inner shoulder 64 which may support a plug or cap securing the conventional weight 68 and cleaning wire assembly 70 in position.

Venting channel 72 communicates with a labyrinth 74 defined by communicating adjacent channels, such as 78 and 80. A vertical channel 84 is defined at one end of the labyrinth and communicates with the labyrinth top channel as at 76. Manifestly, the distance between the writing tube tip 34' and the lateral venting channel 72 may be varied by repositioning of the height of channel 72 within the labyrinth 74.

We claim:

1. A stylographic ink writing pen comprising:

A. a housing having a venting channel extending from the exterior to the interior thereof;

B. a writing nib;

C. a tubular writing tip having its lower end extending through the bottom of said nib;

D. an ink reservoir supported within said nib and communicant with said writing tip;

E. a threaded venting stem including a venting aper-

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ture and reciprocably positioned within said housing and between said venting channel and the interior of said reservoir, said stem being vertically adjustable within said housing, so as to vary the height of said venting aperture interior and with respect to said writing tip;

F. a weight and cleaning wire assembly supported within said threaded venting stem, such that said cleaning wire extends reciprocably into said tubular writing tip.

2. A stylographic writing pen as in claim 1, said venting stem including an helical exterior venting channel extending from the top to the bottom thereof and a radially inwardly extending venting aperture extending interiorly from the bottom of said helix.

3. A stylographic writing pen as in claim 2, said housing venting channel communicating with said venting stem helix.

4. A stylographic writing pen as in claim 3, said venting stem, said writing nib and tubular writing tip being vertically adjustable with respect to said venting channel in said housing.

$$F = lg \times - 2\gamma/r_A$$

Where:

F = magnitude of the hydrostatic head

l = density of the writing fluid

g = acceleration due to gravity 980 cm/sec.²

r_A = radius of vent stem bottom tip

$\times$ = distance between vent stem bottom tip and the lower end of the writing point.

γ = surface tension of writing fluid.

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