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(21) International Application Number: PCT/US98/23393 (22) International Filing Date: 2 November 1998 (02.11.98) (30) Priority Data: 08/964,790 5 November 1997 (05.11.97) US (71) Applicant: BIC CORPORATION [US/US]; 500 Bic Drive, Milford, CT 06460 (US). (72) Inventors: RUKAN, Ronald, S.; 230 Deer Spring Lane, Simpsonville, SC 29680 (US). CHADWICK, Barry, W.; 233 Riverwalk Drive, Simpsonville, SC 29680 (US). (74) Agents: MARSHALL, Jonathan, A. et al.; Pennie & Edmonds LLP, 1155 Avenue of the Americas, New York, NY 10036 (US).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: DOUBLE SEAL SYSTEM FOR PRESSURIZED WRITING DEVICE (57) Abstract A writing device (10) generally including a uniformly cylindrical main body (12) partially filled with a writing medium such as ink (14). A writing tip (19) is inserted into a first end (16) of the main body (12) and a first sealing member (24) is inserted into the second end (20) thereof. The first sealing member (24) is located in the main body (12) near the second end (20). A pressurized gas such as nitrogen (26) is disposed in the body (12) between the ink (14) and the first sealing member (24). Alternatively, a gas forming means may be located in the main body (12) to continually produce a gas as the ink (14) is depleted to maintain pressure therein. A second sealing member (28) is inserted into the second end (20) of the main body (12) to provide a dual seal gas pressurized system.		

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DOUBLE SEAL SYSTEM FOR PRESSURIZED WRITING DEVICETechnical Field

The present invention relates generally to pressurized
5 writing devices and more specifically to gas pressurized
writing devices.

Background of the Invention

Pressurized writing instruments have been in use for
10 many years. Pressurized devices were incorporated into
writing instruments to improve and maintain continuous ink
flow to the tips of the writing instruments during operation
of the instruments for extended periods in horizontal and
upside down positions. Moreover, the use of pressurized
15 devices in writing instruments has reduced the need to
vigorously shake the instrument to initiate ink flow after
mere storage of a partly empty pen or cartridge in an
inverted position.

Pressurized systems have been used to minimize solvent
20 loss in writing instruments which employ highly volatile
solvents and in applications which employ high viscosity inks
wherein pressure is needed to force the flow of ink to the
writing tip.

Mechanical and chemical pressurizing devices are two
25 types of pressurizing systems which have been employed in
writing instruments. Mechanical pressurizing devices contain
a mechanism such as a spring to maintain constant pressure on
the writing medium as consumption of the writing medium
proceeds. Gas pressurized systems produce a pressurized gas
30 such as nitrogen through chemical reactions, fermentation and
the like, to maintain pressure on the writing medium for
continuous supply of the medium to the point or nib of the
writing instrument.

U.S. Patent No. 3,130,711 to Eckerle discloses a
35 positive pressure ball point pen which employs a gas
pressurized system to maintain pressure on the writing medium
in the pen. Pressure is maintained as the result of an

electrolytic action between dissimilar metals (metals having different positions in the electromotive series of metals) within the pen or cartridge. The container body or cartridge is formed of a metal such as brass and portions of the inner surface thereof are coated with a different metal such as zinc. The zinc layer is coated with an insulative protective layer which is insoluble in the writing medium (ink) but soluble in the hydrocarbon grease plug which acts as an ink follower. A body of fluid electrolyte is disposed behind the hydrocarbon grease plug and contacts the dissimilar electrode metals as the ink becomes depleted. A gas is produced as the metals come into contact with the electrolyte. Hence, the pressure is maintained as the ink is consumed. A rubber plug is inserted into the end of the container to seal the system from the outside atmosphere and prevent leakage thereof.

Although plug members as described above are used in gas pressurized systems to maintain a seal on the writing instrument and prevent leakage of the gas from the system, poor seals often result from the inability to hermetically seal a plug within the writing instrument. This is difficult to do in gas pressurized systems which prevent the use of certain bonding techniques due to the potential interaction or exposure of the bonding material or solvent with the gas. In an effort to provide more effective sealing, liquid sealants have been used in conjunction with plug members to maintain the integrity of the gas seal. This combination often produces internal pressure variations which interfere with the uniform flow of the writing medium.

There remains a need for a writing device in which the internal pressure is maintained throughout the entire life of the writing device without overly complex or expensive seals to allow for smooth and continuous flow of ink regardless of the orientation of the writing device. It is desirable to provide a gas pressurized writing device having a tight seal whereby gas is not lost to the atmosphere.

Summary of the Invention

These and other objects and advantages are accomplished in a writing device generally including a uniformly cylindrical main body partially filled with a writing medium 5 such as ink. A writing tip is inserted into a first end of the main body and a first sealing member is inserted into the second end thereof. The first sealing member is located in the main body near the second end. A pressurized gas such as nitrogen is disposed in the body between the ink and the 10 first sealing member. Alternatively, a gas forming means may be located in the main body to continually produce a gas as the ink is depleted to maintain pressure therein. A second sealing member is located between the first sealing member and a second end of the main body.

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Brief Description of the Drawings

Features of the present invention are disclosed in the accompanying drawings, wherein similar reference characters denote similar elements throughout the several views, and 20 wherein:

Fig. 1 is a cross-sectional view along the longitudinal axis of the writing device of the present invention; and

Fig. 2 is an enlarged view of the sealing members shown in Fig. 1.

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Detailed Description of the Invention

Turning to Fig. 1, an embodiment of a writing device 10 constructed in accordance with the present invention is shown with the understanding that those of ordinary skill in the 30 art will recognize many modifications and substitutions which may be made to various elements.

Writing device 10 generally includes a main body 12 partially filled with ink 14. Writing device 10 may be used independently as a writing instrument or may be inserted as a 35 cartridge into a barrel or writing implement housing. Body 12 may primarily be formed of a rigid polymer or plastic material such as nylon, acrylonitrile, butadiene, styrene

terpolymer, or the like. Main body 12 is substantially and uniformly cylindrical along the length of its interior wall 13 and tapers towards a first end 16. A point or nib 18 is formed on first end 16 through which an ink tip 19 is
5 positioned. At a second end 20 opposite first end 16 is an opening 22 through which a first or primary sealing member 24 is inserted. Sealing member 24 is a solid tubular member having tapered ends 24' and 24'' and is disposed a short distance from end 20 of body 12. A fluid tight seal is
10 created by an interference fit between sealing member 24 and main body 12. A pressurized medium such as nitrogen gas 26 is disposed in body 12 between ink 14 and sealing member 24. The gas is pressurized to maintain a constant and continuous pressure on ink 14 such that ink 14 continuously and evenly
15 flows through writing tip 19. Alternatively, a gas forming means, such as that set forth in U.S. Patent No. 3,130,711 and incorporated by reference herein, may be located in the main body to continually produce a gas as the ink is depleted to maintain pressure therein.

20 Sealing member 24 is typically fabricated of a polymeric material such as polyethylene. Sealing member 24 is inserted longitudinally under pressure within body 12 and is radially contiguous with interior wall 13. However, with sealing member 24 alone, as in the prior art, it can be difficult to
25 provide a hermetic seal between sealing member 24 and interior wall 13 due to the variations in the surfaces of member 24 and interior wall 13. Additionally, the method of insertion of member 24 into body 12 against interior wall 13 is limited due to the presence of gas in body 12. Methods
30 such as welding or solvent bonding are undesirable due to the potential of interaction or leakage of gas during the process. In particular, if welding was used to bond the primary seal within body 12, the gas present therein would puncture holes in the bond formed between the two surfaces.

35 In order to provide a secure sealing system according to the present invention, a second or secondary sealing member 28 is inserted into end 20 and bonded or welded thereto in a

fluid tight manner proximate first sealing member 24. It is preferable that sealing member 28 not be in contact with sealing member 24 so that all of the welding or bonding energy is transferred to the seal between sealing member 28 and interior wall 13 of body 12, and not divided between the bond formed between sealing member 28 and interior wall 13 of body 12 and a bond formed between primary seal 24 and secondary seal 28. Preferably, the clearance between sealing member 24 and sealing member 28 in an average writing instrument is at a distance of approximately 0.5 to 1.0 mm although this range is not a limitation on the distance therebetween which may vary depending on the size and shape of the device.

Interior wall 13 at end 20 has a stepped section 21 whereby the diameter of interior wall 13 is larger at this point with respect to the remaining interior. Sealing member 28 is preferably shaped in the form of a plug or button having a stem 30 thereon such that a first end of member 28 defining stem 30 fits within body 12. Stem 30 is tapered at the end thereof and provided to direct and maintain member 28 in body 12 during the insertion process. As shown, stem 30 does not contact interior wall 13 although this is by no means a limitation thereto and contact with wall 13 may or may not exist.

A second end 32 of member 28 defines a button portion having a first button section 32' which is radially contiguous with stepped section 21 of interior wall 13 of body 12. A second button section 32'' of slightly larger diameter than section 32' abuts second end 20 and is flush with the exterior surface 29 of body 12. Sealing member 28 may be welded or bonded to body 12. It is preferable that sealing member 28 be ultrasonically or kinetically welded to body 12 to provide a tight leak-proof seal. Sealing member 28 is typically fabricated of a rigid polymer or plastic material such as nylon, acrylonitrile, butadiene, styrene terpolymer, or the like although the shape and material of sealing member 24 is not limited to the specific shape and

material mentioned. It is preferable that sealing member 28 be fabricated of the same material as body 12 such that the surfaces of body 12 and sealing member 28 meld into one component. The combination of sealing members 24 and 28
5 provides a double sealing system against the leakage of gas out of body 12.

The writing device of the present invention may be constructed by providing main body 12 having first end 16, second end 20 and interior wall 13. Ink 14 and gas 26 are
10 inserted into main body 12 under pressure. Primary sealing member 24 is inserted under pressure into main body 12 immediately thereafter. Secondary sealing member 28 is inserted into second end 20 of main body 12 and sealed to the interior surface of main body 12 by welding or bonding (such
15 as by solvent bonding).

As will be readily appreciated, the present invention provides one with a novel pressurized writing device which maintains constant pressure within the main body thereof and results in a steady flow of the writing medium when the
20 device is in contact with writing paper or like means. Leakage of gas is prevented or reduced due to the combination of the primary and secondary sealing members

While various descriptions of the present invention are described above, it should be understood that the various
25 features can be used singly or in any combination thereof. Therefore, this invention is not to be limited to only the specifically preferred embodiments depicted herein.

Further, it should be understood that variations and modifications within the spirit and scope of the invention
30 may occur to those skilled in the art to which the invention pertains. Accordingly, all expedient modifications readily attainable by one versed in the art from the disclosure set forth herein that are within the scope and spirit of the present invention are to be included as further embodiments
35 of the present invention. The scope of the present invention is accordingly defined as set forth in the appended claims.

CLAIMS

1. A writing device comprising:
a main body having two ends;
5 a writing medium in the main body;
an application point positioned on a first end of
the main body;
a pressurized medium located in the main body
acting on the writing medium;
10 a first sealing member disposed in the main body
near the second end thereof; and
a second sealing member inserted in the second end
of the main body.
- 15 2. The writing device of claim 1 wherein the first
sealing member creates a fluid tight interference fit within
the main body and the second sealing member is bonded in the
second end in a fluid tight manner.
- 20 3. The writing device of claim 2 wherein the main body
is cylindrical in shape and the first end thereof is tapered
to support the application point therein.
4. The writing device of claim 3 wherein the gas is
25 present between the writing medium and the first sealing
member.
5. The writing device of claim 4 wherein the first
sealing member is not in contact with the second sealing
30 member.
6. The writing device of claim 5 wherein the first
sealing member comprises a middle tubular section and a pair
of tapered ends.

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7. The writing device of claim 6 wherein the tubular section is radially contiguous with the interior surface of the main body.

5 8. The writing device of claim 7 wherein the second tubular member comprises a stem section and a button section.

9. The writing device of claim 1 being an independent writing instrument.

10

10. The writing device of claim 1 being a cartridge which may be inserted into a writing holder.

11. A writing device comprising:
15 a main body having two ends;
 a writing medium in the main body;
 an application point positioned on a first end of the main body;
 a pressurized medium located in the main body
20 acting on the writing medium;
 a first sealing member disposed in the main body near the second end thereof wherein the first sealing member creates a fluid tight interference fit within the main body;
and
25 a second sealing member inserted in the second end of the main body in a fluid tight manner.

12. The writing device of claim 11 wherein the second sealing member is welded to the main body.
30

13. The writing device of claim 12 wherein the second sealing member is solvent bonded to the main body.

14. A method of providing a pressurized writing device
35 comprising the steps of:

providing a main body having a first end, a second end and an interior capable of holding ink therein and having an application point located on the first end thereof;

inserting ink into the main body;

5 inserting a gas under pressure into the main body following the ink and inserting a primary sealing member into the main body immediately thereafter, wherein first sealing member creates a fluid tight interference fit with the main body;

10 inserting a secondary sealing member into the second end of the main body;

 welding the secondary sealing member to the surface of the main body.

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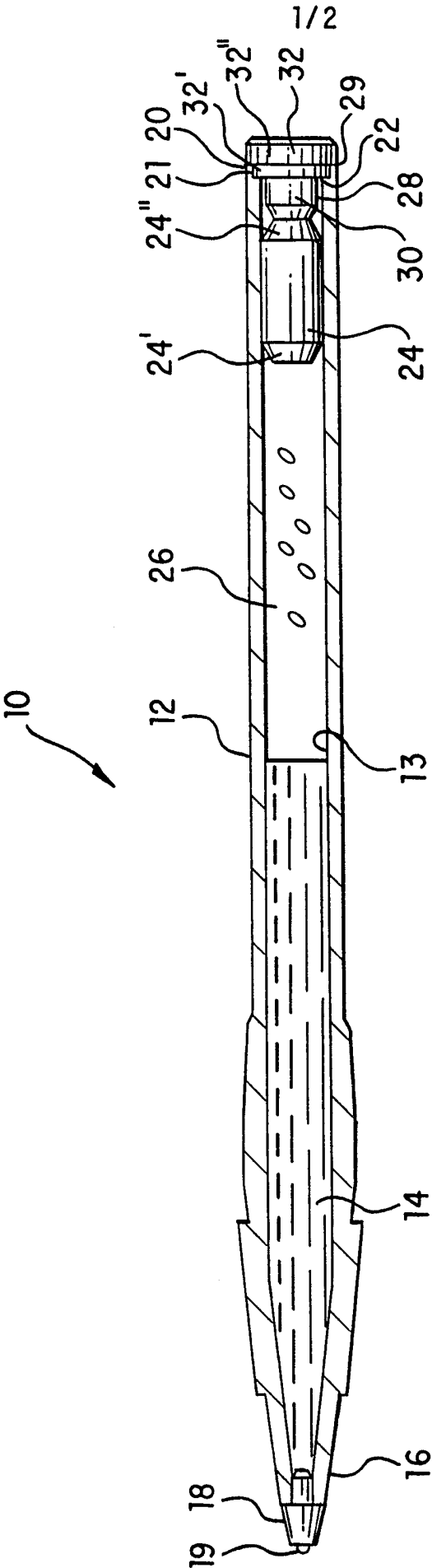


FIG. 1

2 / 2

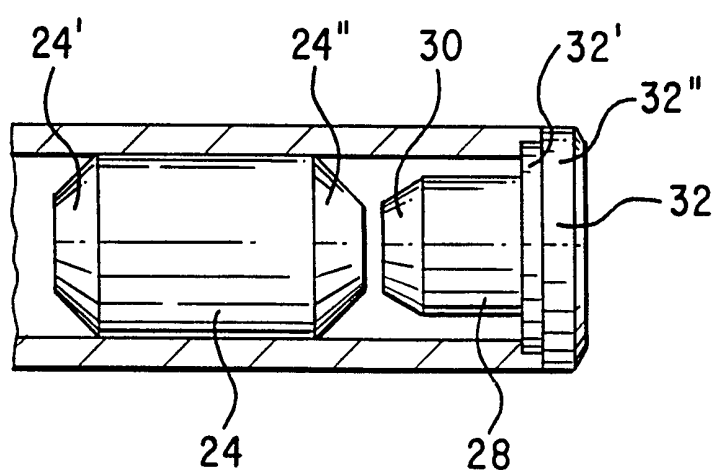


FIG. 2

INTERNATIONAL SEARCH REPORT

 International application No.
PCT/US98/23393

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B43K 7/08, 5/02; A46B 5/02; B05C 17/00; B43K 7/00, 7/02, 5/00

US CL :401/142, 143, 190, 208, 209, 217, 221

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 401/142, 143, 190, 208, 209, 217, 221

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

None

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

None

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	US 5,738,459 A (SMITH) 14 April 1998, see entire document.	1, 11
Y	US 4,587,999 A (BOIKO et al.) 13 May 1986, see entire document.	1-13



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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