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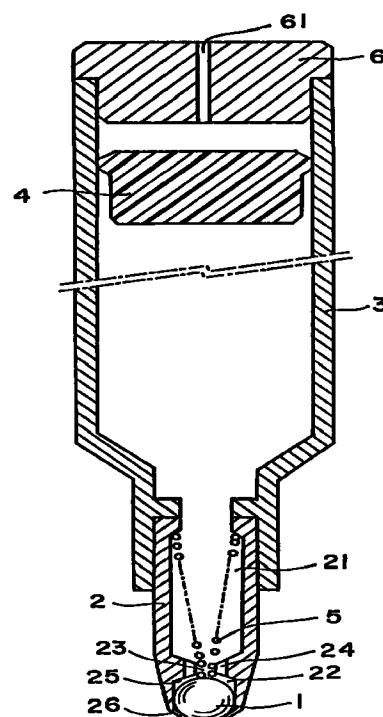
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(54) Ballpoint pens

(57) Disclosed is a ballpoint pen having a barrel (3) directly filled with an ink, which has a simple structure and can be produced inexpensively. A slide plug (4) is disposed slidably to be fluid tight in a barrel, with an ink being charged in the space forward than the slide plug; and a tip (2) retaining a ball (1) therein such that the ball (1) may partly appear from the front edge of the tip is fixed to the front end portion of the barrel; wherein the ball is resiliently urged by a spring (5) to be brought into contact with the caulked front edge of the tip, when said ballpoint pen is not used. Alternatively, the slide plug may be replaced with a paste-like counterflow preventing material (7). The spring preferably having a small mass and is disposed within the tip.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a direct filled type ballpoint pen having an ink directly charged to an ink reservoir thereof.

Description of the Related Art

Since inks, particularly aqueous inks, have low viscosity, it is necessary in a ballpoint pen employing an aqueous ink to prevent dripping of the ink. For such purpose, most of the ballpoint pens are of core wad type, in which a rod-shaped core wad, prepared by stretching and shaping together curled extra fine fibers, is impregnated with an aqueous ink, and the ink in the core wad is designed to be fed to the ball via a relay core. However, such type of ballpoint pens suffer inconveniences that there is a limit in the ink absorbing capability of the core wad, so that the total length of the matter which can be written with such pen (total writing length) is short, and that it is impossible to use up the ink contained therein, making it difficult to know the end point.

Under such circumstances, direct filled type ballpoint pens are put into practical uses. In this type of ballpoint pen, an ink is directly charged to an ink reservoir, and a pen head having a mechanism of replacing the ink with air and a mechanism of containing surplus ink is attached to the front end of the barrel. Since a large amount of ink can be charged into the ink reservoir in the direct filled type ballpoint pen, the total writing length is long and the ink can be used up, advantageously.

However, since the pen head of the above-described ballpoint pen has a complicated structure because of the capillary ink and air grooves and the comb-shaped ink reservoir consisting of a plurality of teeth. In addition, accuracy is required of the pen head, because it must be brought into intimate contact with the inner circumference of the ink reservoir. Accordingly, it takes time and trouble for the production of the pen head, becoming a major cause of preventing cost reduction.

SUMMARY OF THE INVENTION

Therefore, it is an objective of the invention to provide a direct filled type ballpoint pen which has a simple structure and can be produced inexpensively.

In order to attain the intended object, in the ballpoint pen according to this invention, a slide plug is slidably disposed to be fluid tight in an ink reservoir; an ink is charged to the space forward than the slide plug; and a tip retaining a ball rotatably therein such that the ball may partly appear from the front edge of the tip is attached to the front end portion of the ink reservoir, wherein the ball is resiliently urged by a spring to be

brought into contact with the caulked front edge of the tip, when the ballpoint pen is not used.

Alternatively, a paste-like counterflow preventing material is disposed in place of the slide plug. Preferably, a spring having a small mass is used and is disposed within the tip.

When the ballpoint pen is not used, since the ball rotatably retained in the front end portion of the tip is resiliently urged by the spring to be brought into contact with the caulked front edge of the tip, a valve mechanism can be formed by the ball and the caulked front edge of the tip. Accordingly, even if the ink contained in the ballpoint pen has a low viscosity, dripping of the ink can be prevented. Meanwhile, during writing, the ball is retracted by the hand force to open the valve mechanism and allow the ink to be consumed. Since the slide plug or the counterflow preventing material advances as the ink is consumed, the negative pressure to be generated in the ink reservoir with the consumption of the ink can be canceled to allow the ink to be fed to the ball, enabling writing with the ballpoint pen. Namely, since the pen head which has a complicated structure and is required to have accuracy becomes unnecessary, a ballpoint pen having a simple structure can be produced inexpensively according to this invention.

Further, by virtue of the spring having a small mass disposed in the tip, even if a great impact is applied to the ballpoint pen, for example, when the ballpoint pen is dropped onto the floor, the inconvenience that the ball slips off the tip can be prevented, because the inertia force of the spring is small and the spring pushes the ball weakly.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of this invention that are believed to be novel are set forth with particularity in the appended claims. The invention, together with the objects and advantages thereof, may best be understood by reference to the following description of the preferred embodiments taken in conjunction with the accompanying drawings in which:

Fig. 1 is a cross-sectional view of the ballpoint pen according to one embodiment of the invention; and

Fig. 2 is a cross-sectional view of the ballpoint pen according to another embodiment of the invention.

PREFERRED EMBODIMENT OF THE INVENTION

This invention will be described in detail by way of the illustrated embodiments. In Fig. 1, a bullet-like stainless steel tip 2 has a bore 21 through which an ink is passed and is also provided with a ball house 22 at the front end portion thereof. The ball house 22 communicates to the bore 21 via a center hole 23 and vertical grooves 24 formed radially. A ball 1, for example, made of a hard metal and having a diameter of 1.0 mm is

retained in the ball house 22 to be movable forward and backward over a predetermined stroke, and appears partly from the front edge 26 of the tip 2.

A spring 5 having a small mass is disposed in the bore 21 of the chip 2. The front end portion of the spring 5 is inserted to the center hole 23 so as to urge the ball 1 forward and bring the ball 1 into contact with the front edge 26 of the tip 2 when the ballpoint pen is not used. Namely, a valve mechanism is formed between the ball 1 and the front edge 26 of the tip 2, and dripping of the ink is designed to be prevented without using the pen head. Incidentally, a pusher may be interposed between the ball 1 and the spring 5 so as to urge the ball 1 forward by the pusher. The thus constituted tip 2 is attached directly or via a holder (not shown) to the front end opening of the ink reservoir 3 serving also as the barrel.

A slide plug 4, for example, made of a silicone rubber is slidably disposed to be fluid tight within the ink reservoir 3, and an aqueous ink (not shown), so-called a gel ink, having a relatively high static viscosity which can be lowered by the rotation of the ball is fully charged in the space forward than the slide plug 4 to the bore 21 of the tip 2, with no air migrated therein. Accordingly, the slide plug 4 slides forward as the ink is consumed. In other words, while the ballpoint pen according to this invention is of the direct filled type which can provide a long total writing length, the sliding resistance of the slide plug 4 contributes to the prevention of ink dripping, because no air which can readily be expanded by heat is migrated into said space. A tail plug 6 having a vent 61 is fitted to the rear end portion of the ink reservoir 3.

Alternatively, a paste-like counterflow preventing material 7 may be disposed in place of the slide plug 4, as shown in Fig. 2, and a gel ink (not shown) may be charged in the space forward than the material 7 to the center hole 21 of the tip 2.

When the ballpoint pen is to be used, the ballpoint pen is moved with the ball 1 thereof being pressed against a surface to be written. Then, the ball 1 retracts against the resilience of the spring 5 and rotates in contact with the seat 25, thus enabling writing with the ballpoint pen. In this case, while a negative pressure is generated in the ink reservoir 3 as the ink is consumed, the slide plug 4 or the counterflow preventing material 7 advances as the ink is consumed. Accordingly, the negative pressure in the ink reservoir 3 is canceled to allow the ink to be fully fed to the ball 1, enabling continuous writing with the ballpoint pen.

Meanwhile, since the valve mechanism consisting of the ball 1 and the front edge 26 of the tip 2 is closed even when the tip 2 of the thus constituted ballpoint pen is allowed to face upward, the slide plug 4 or counterflow preventing material 7 is prevented from being under the ink head, and further it does not happen that the slide plug 4 or counterflow preventing material 7 retracts to allow the ink to leak from the rear end of the ink reservoir 3.

As has been described heretofore, in the ballpoint pen according to this invention, the ball rotatably retained in the front end portion of the tip is resiliently urged by the spring to be brought into contact with the caulked front edge of the tip and form a valve mechanism, and a slide plug or a paste-like counterflow preventing material is disposed in the ink reservoir, so that dripping of the ink can be prevented. Besides, since the slide plug or counterflow preventing material advances if the ink is consumed, the ink reservoir does not assume a negative internal pressure, thus enabling continuous writing with the ballpoint pen. Further, since the valve mechanism consisting of the ball and the front edge of the tip is closed when the tip is allowed to face upward, the slide plug or counterflow preventing material is prevented from being under the ink head, and further it does not happen that the slide plug or counterflow preventing material retracts to allow the ink to leak from the rear end of the ink reservoir. Accordingly, the pen head which has a complicated structure and is required to have accuracy becomes unnecessary, and thus a ballpoint pen which has a simple structure can be produced inexpensively according to this invention.

Further, by virtue of the spring having a small mass disposed in the tip, even if a great impact is applied to the ballpoint pen, for example, when the ballpoint pen is dropped onto the floor, the inconvenience that the ball breaks through the front edge of the tip to slip off therefrom can be prevented, because the inertia force of the spring is small and the spring pushes the ball weakly.

It should be apparent to those skilled in the art that the present invention may be embodied in many other specific forms without departing from the spirit or scope of the invention. Therefore, the present embodiments are to be considered as illustrative and not restrictive, and the invention is not to be limited to the details given herein, but may be modified within the scope of appended claims.

Claims

1. A ballpoint pen comprising:

an ink reservoir;
a slide plug disposed slidably to be fluid tight in said ink reservoir, with an ink being charged in the space forward than said slide plug; and
a tip retaining a ball rotatably therein such that said ball may partly appear from the front edge of said tip, said tip being fixed to the front end portion of said ink reservoir;
wherein said ball is resiliently urged by a spring to be brought into contact with the caulked front edge of said tip, when said ballpoint pen is not used.

2. A ballpoint pen comprising:

an ink reservoir;

a paste-like counterflow preventing material disposed in said ink reservoir, with an ink being charged in the space forward than said paste-like counterflow preventing material; and

a tip retaining a ball rotatably therein such that said ball may partly appear from the front edge of said tip, said tip being fixed to the front end portion of said ink reservoir;

wherein said ball is resiliently urged by a spring to be brought into contact with the caulked front edge of said tip, when said ballpoint pen is not used.

3. The ballpoint pen according to Claim 1 or 2, wherein said spring has a small mass and is disposed within said tip.

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FIG. 1

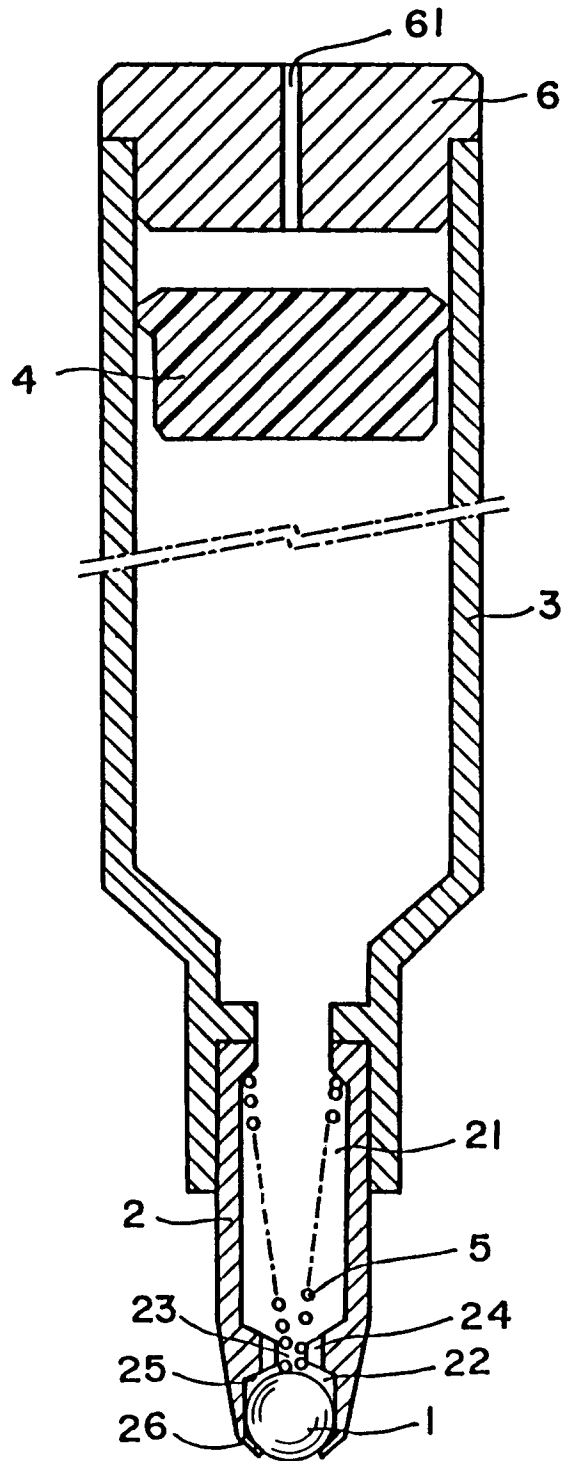
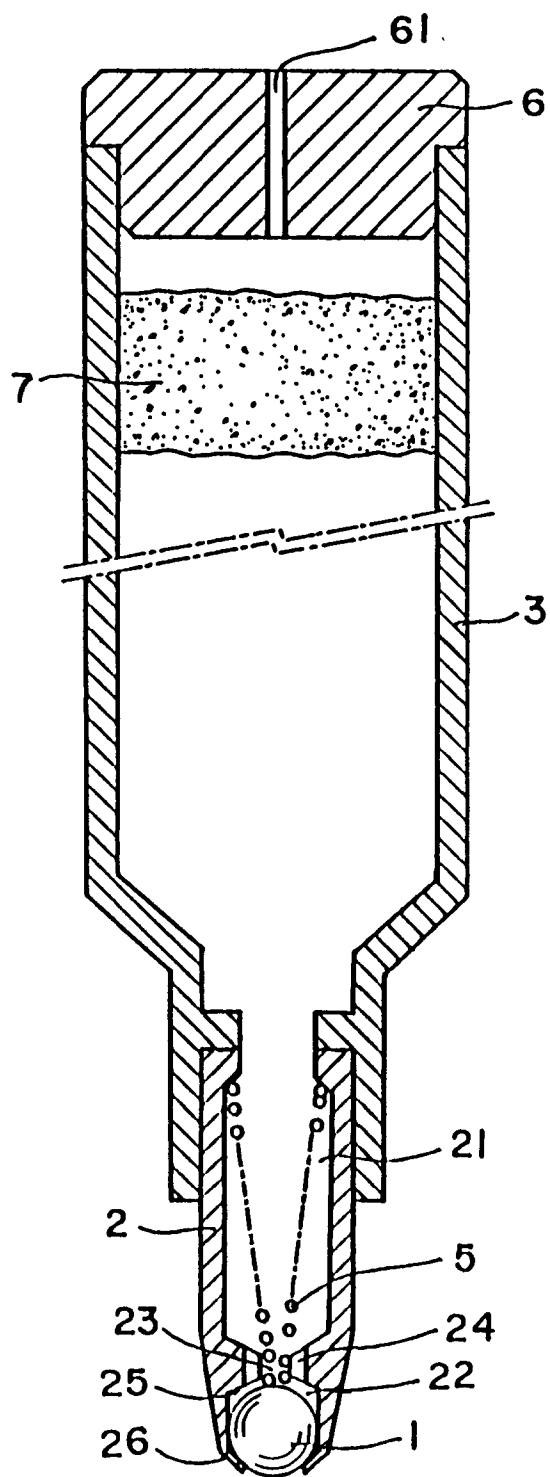


FIG. 2





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EUROPEAN SEARCH REPORT

Application Number
EP 95 10 5192

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	NL-C-65 419 (REYNOLDS PEN COMPANY)	1,3	B43K7/08
Y	* the whole document *	2	B43K7/01

Y	BE-A-509 365 (OSMIOR)	2	
	* claims *		

A	GB-A-2 097 007 (MARK-TEX)	1,3	
	* abstract; figure 1 *		

A	GB-A-2 281 257 (MITSUBISHI PENCIL KABUSHIKI KAISHA)	2	
	* abstract; figure 2 *		

			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B43K
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		23 August 1995	Perney, Y
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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