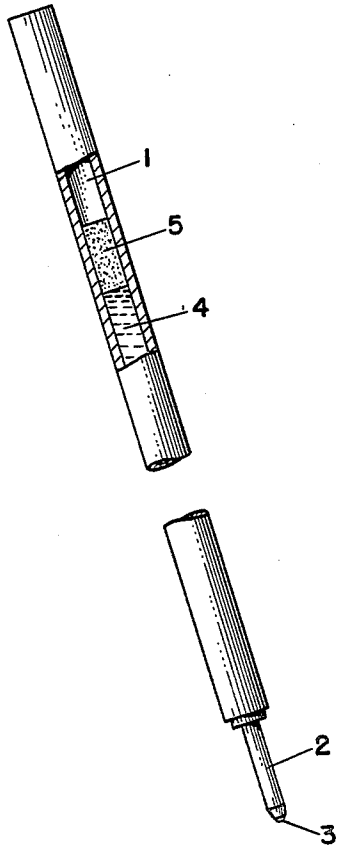
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BALL POINT PEN INCORPORATING A GREASE PLUG AND METHOD OF INHIBITING PENETRATION OF INK INTO THE PLUG

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BALL POINT PEN INCORPORATING A GREASE PLUG AND METHOD OF INHIBITING PENETRATION OF INK INTO THE PLUG

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This invention relates to a specialized lubricating-type grease.

Lubricating-type greases are used as plugs in the ink cartridges of ball point pens. After the ink has been placed in the cartridge, a solid grease plug is inserted to prevent the ink from flowing back out the open end. As the pen is used and the ink level decreases in the cartridge, the plug slides down in contact with the upper surface of the ink.

When certain types of ink are used, the ink tends to penetrate the grease and sometimes escapes. Red ink is particularly prone to leak through the grease seal.

It is the object of this invention to provide a grease which substantially resists the penetration of ink.

I have found that ink penetration of the plug is prevented by the incorporation of powdered metal into the grease.

The invention will be further described by reference to the drawing which discloses a ball point pen ink cartridge. Reference numeral 1 designates the interior portion of an annular ink cartridge open at one end and terminating in a point 2 having a ball 3 at the extremity. The cartridge contains a supply of a suitable ink 4 in contact with the ball. Reference numeral 5 designates a grease plug containing powdered metal. As the ink level decreases in the cartridge, the plug slides down in contact with the upper surface of the ink. The cartridge, point, and ball may be of any conventional material known in the art, and the ink may be of any conventional chemical composition. No novelty is claimed for any of the components of the cartridge other than the grease plug.

The base grease may be any of the commonly used formulations which remain solid up to 140° F. and do not bleed at that temperature. In a conventional grease, the components are a major amount of oil and a minor amount of soap. A Number 1 (penetration 310–340) or Number 2 (penetration 265–295) grease is preferred with a penetration of 290–310 being the most suitable range. The latter classifications are based on a temperature of 77° F. Solvent refined lubricating oils and mixtures of refined and distilled oils are suitable oil components. The oil is present in amounts of from 70 to 90% by weight. Soaps resulting from the chemical combination of metals and one or more fatty acids are used. Examples are aluminum stearate, barium oleate, calcium palmitate and mixtures thereof. Lithium and sodium soaps may be used. The soaps are present in amounts of from about 6 to about 15% by weight. Synthetic greases such as those with an ester base are also suitable.

The powdered metal should be one which is inert to ink compositions and is preferably selected from the group consisting of aluminum, zinc, copper and lead. While the amount of metal depends to some extent on the grease base, a range of 1 to 20% by weight metal may be used and 1 to 10% by weight is the preferred range. More than 25% metal may cause the grease to stick in the cartridge. Generally speaking, the finer the metal powder the better. A particle size of 200 to 400 mesh is suitable with 300 to 400 mesh being preferred. The grease and metal powder are blended in any suitable equipment which achieves thorough mixing.

In order to illustrate my invention more clearly and the

advantageous results obtained thereby, the following test was performed:

An aluminum complex grease was prepared consisting of the following:

43.4% solvent extracted lubricating oil
32.6% bright stock
6.8% stearic acid
2.9% benzoic acid
14.3% Kolate 40*

*Proprietary name of J. W. Ayers & Co., Easton, Pa. for their oxo-aluminum compound which combines with stearic acid and benzoic acid to form an aluminum-benzoate-stearate gel system.

A portion of the grease was mixed with 5% of aluminum powder of at least 325 mesh.

The following test method was used to determine the effectiveness of the greases for use as an ink cartridge plug.

A 4¼ inch long glass tube (0.6 mm. I.D.) is sealed at one end with a plastic plug. It is then filled ⅔ full of red ink and capped with a grease plug 0.9 mm. long. This tube is inverted, grease end down, in an oven at 140° F. for two weeks. A satisfactory grease will not bleed oil, will retain the ink and will not be penetrated by the ink to any great extent over a long period of time. The test results are as follows:

	Hours at 140° F.	Rating [1]
No aluminum	48	B
	96	B
	160	D
	208	D
	312	E
5% Aluminum	64	C
	280	C
	452	D

[1] The ratings are based on an empirical test in which the observer looks through the tube to estimate the amount of ink which has penetrated the plug. A rating of "A" represents no penetration, "B"—very slight penetration, "C"—slight penetration, "D"—penetration of ¼ of the grease plug, "E"—½ of the grease plug, "F"—½ of the grease plug and "G"—⅔ of the grease plug.

The data indicate that the grease containing no aluminum was rated "D" (meaning ink penetrated into ¼ of the grease plug) after 160 hours, whereas the grease containing the powdered aluminum was penetrated ¼ its length by the red ink only after 452 hours.

When it is considered that ball point pens may well reach temperatures approximating 140° F. during transportation and storage in the summertime, it is seen that applicant's invention provides a method of protecting against ink leakage.

I claim:

1. The method of inhibiting ink penetration of a lubricating grease-type plug in a fountain pen reservoir in contact with ink which comprises incorporating in the grease a small amount of powdered metal which is inert to ink compositions.

2. The method according to claim 1 wherein the amount of metal is 1 to 10% by weight.

3. The method according to claim 2 wherein the metal is selected from the group consisting of aluminum, copper, zinc and lead.

4. The method according to claim 2 wherein the metal is aluminum.

5. In a ball point pen ink cartridge wherein a lubricating grease plug is used to hold the ink in place, the improvement consisting of incorporating in the said plug a small amount of powdered metal which is inert to ink compositions.

6. In a ball point pen ink cartridge wherein a lubricating plug is used to hold the ink in place, the improvement

consisting of incorporating 1 to 10% by weight of powdered metal selected from the group consisting of aluminum, copper, zinc and lead in the said plug.

7. In a ball point pen ink cartridge wherein a lubricating grease plug is used to hold the ink in place, the improvement consisting of incorporating 1–10% by weight of powdered aluminum in the said plug.

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