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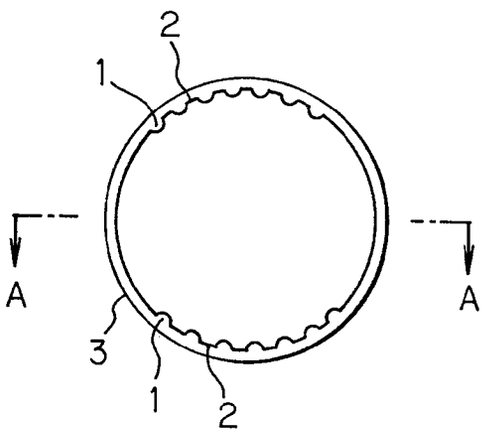
(54) Vessel provided with visibility for residual amount of colored liquid

(57) Provided is an ink vessel (3) in which visibility for a residual amount of a liquid can be ensured even when a wettability of the vessel wall contacted has been changed to a large extent and the visibility for a residual amount of a liquid has been indistinct in the case where a surface tension of the liquid is extremely low, in the case where organic solvents other than water are used as a solvent or in the case where various synthetic resins are used as a material for the vessel. The vessel is provided with visibility for a residual amount of a colored liquid, wherein plural lines of semi-cylindrical transparent projections (1) having an almost semi-circular cross section are disposed parallel at intervals (2) in the inside of the transparent vessel containing an opaque liquid in a direction in which the residual amount of the liquid has to be confirmed.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

(1) Field of the Invention

The present invention relates to an ink vessel which is suitable when a residual amount of a colored liquid ink has to be sometimes confirmed visually in uses in which an ink regardless of water soluble and oil soluble is fed from vessels, such as a writing tool in which an ink is directly used in the form of a liquid, an ink container employed when an ink is used for a printer in the form of ink jet and an ink reservoir employed when a liquid ink is used directly for a recorder.

(2) Description of the Related Art

Conventional ink bottles are cylindrical or rectangular glass bottles, and since in conventional inks for fountain pens, a residual amount thereof is readily detectable, no examples of bottles provided with visibility for residual amounts thereof have been found.

Cartridge type ink reservoirs which are put into fountain pens, disclosed in Japanese Utility Model Publication No. Sho 30-4710, Japanese Utility Model Publication No. Sho 37-5729, Japanese Utility Model Publication No. Sho 37-5728 and Japanese Utility Model Publication No. Sho 38-7326 are known, though they do not intend to provide the ink reservoirs with visibility for residual amounts of colored liquids, as those in which projected grooves are provided on circumferential wall faces in the cartridges for a purpose to ensure flow-down of ink when fountain pens are turned into a use state in which pen points of the fountain pens are held downward from a non-use state in which the pen points are held upward, particularly when a residual amount of the ink decreases. However, all of them intend to cause an ink stored in the reservoirs to flow down surely and quickly by vertical dislocation of the ink reservoirs and do not have a purpose to provide the ink reservoirs with visibility for a residual amount of an ink.

SUMMARY OF THE INVENTION

An object of the present invention is to provide an ink vessel which is suitable when a residual amount of a colored liquid ink has to be sometimes confirmed visually in uses in which an ink regardless of water soluble and oil soluble is fed from vessels, such as a writing tool in which ink is directly used in the form of a liquid, an ink container employed when the ink is used for a printer in the form of ink jet and an ink reservoir for a recorder.

The present invention relates to:

(1) a vessel provided with visibility for a residual amount of a colored liquid, wherein plural lines of ridge-shaped transparent projections having a cross section showing a domed curve are disposed parallel at intervals in the inside of a transparent vessel containing an opaque liquid in a direction in which a residual amount of the liquid has to be confirmed,

(2) the vessel provided with visibility for a residual amount of a colored liquid as described in the above item (1), wherein the ridge-shaped projections are semi-cylindrical; a radius (R) thereof falls in a range of 0.15 to 1.5 mm; and intervals at which the projections are disposed parallel fall in a range of 0.4 to 2.0 mm in terms of an intersectional interval of the semi-cylindrical projections with the inner wall of the vessel,

(3) the vessel provided with visibility for a residual amount of a colored liquid as described in the above item (1), wherein the ridge-shaped projections are semi-cylindrical; the radius (R) thereof falls in a range of 0.25 to 1.0 mm; and the intervals at which the projections are disposed parallel fall in a range of 0.8 to 1.0 mm in terms of an intersectional interval of the semi-cylindrical projections with the inner wall of the vessel,

(4) the vessel provided with visibility for a residual amount of a colored liquid as described in any of the above items (1) to (3), wherein when the liquid is of a water base, used as a material resin for the vessel is at least one selected from the group consisting of an acryl base resin, a styrene base resin, a polycarbonate base resin, a polyester base resin, a polypropylene base resin, a polyethylene base resin and a polyallylate base resin; when the liquid is of a polar solvent base, used as a material resin for the vessel is at least one selected from the group consisting of a polyester base resin, a polypropylene base resin, a polyethylene base resin and a polyamide base resin; and when the liquid is of a non-polar solvent base, used as a material resin for the vessel is at least one selected from the group consisting of a polyethylene base resin and a polyamide base resin, and

(5) a vessel provided with visibility for a residual amount of a colored liquid, wherein transparent windows are formed in both of a part where a residual amount of the liquid contained in the vessel has to be detected and a through-vision part disposed oppositely thereto on the reverse side; and the structure as described in any of the

above items (1) to (3) is disposed in these window parts.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a horizontal cross section of the vessel of the present invention in which a plurality of semi-cylindrical projections are provided in the inside thereof.

Fig. 2 is an elevation seen from an A-A line cross section in Fig. 1.

Codes in Fig. 1 and Fig. 2:

1 Semi-cylindrical projection

2 Intersectional interval of the semi-cylindrical projections with the inner wall of the vessel

3 Cylindrical ink reservoir

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

In recent years, inks having extremely low surface tensions unlike conventional inks have come to be used as a water base ink in many cases according to a progress in a surfactant. Further, not only water base but also various solvent base solutions have come to be used as a solvent or a dispersion medium for a colored liquid such as an ink in many cases.

Not only metal and glass but also various synthetic resins have come to be used for vessels. A diversification in the surface tensions of these liquids is accompanied as well with a diversification in a wettability of a vessel wall to be contacted according to the relation of a surface tension of a solid matter. This increases an adhesion of a colored liquid to a vessel wall and masking caused thereby, which deteriorates visibility for a residual amount of the liquid, and in extreme cases, the liquid can not visually be observed

An object of the present invention is to provide a ink vessel which is suitable when a residual amount has to be visually confirmed in a vessel such as an ink vessel for a jet printer and an ink reservoir for a recorder as well as an ink bottle in correspondence to a diversification in surface tensions of liquids and vessel walls.

Intensive researches made by the present inventors in order to solve the problems described above have resulted in finding that the problems can be solved by disposing a plurality of projections having semi-circular cross sections at intervals in a direction (usually, vertical direction) in which a residual amount of a liquid has to be confirmed in the inside of a vessel, and thus completing the present invention.

That is, the present invention relates to a vessel provided with visibility for a residual amount of a colored liquid, wherein plural lines of ridge-shaped transparent projections having a cross section showing a domed curve are disposed parallel at intervals in the inside of a transparent vessel containing an opaque liquid in a direction in which a residual amount of the liquid has to be confirmed. The domed curve is a curve having an almost semi-circular, circular arc-shaped, parabolic or semi-cylindrical cross section.

The present invention relates to the vessel provided with visibility for a residual amount of a colored liquid as described above, wherein the ridge-shaped projections are semi-cylindrical; and when the colored liquid is of an aqueous base, a radius (R) thereof falls in a range of 0.15 to 1.5 mm, and intervals at which the projections are disposed parallel fall in a range of 0.4 to 2.0 mm in terms of an intersectional interval of the semi-cylindrical projections with the inner wall of the vessel.

Further, the present invention relates to the vessel provided with visibility for a residual amount of a colored liquid as described above, wherein the ridge-shaped projections are semi-cylindrical; and when the colored liquid is of a polar or non-polar organic solvent base, the radius (R) thereof falls in a range of 0.25 to 1.0 mm, and intervals at which the projections are disposed parallel fall in a range of 0.8 to 1.0 mm in terms of an intersectional interval of the semi-cylindrical projections with the inner wall of the vessel.

Suitably used for materials for the ink vessel are at least one selected from the group consisting of an acryl base resin, a styrene base resin, a polycarbonate base resin, a polyester base resin, a polypropylene base resin, a polyethylene base resin and a polyallylate base resin when the liquid is of a water system, at least one selected from the group consisting of a polyester base resin, a polypropylene base resin, a polyethylene base resin and a polyamide base resin when the liquid is of a polar organic solvent system, and at least one selected from the group consisting of a polyethylene base resin and a polyamide base resin when the liquid is of a non-polar organic solvent system.

A colored liquid layer flows down on the surface of the cylinder more rapidly than an inner wall face part in the vessel by providing semi-cylindrical transparent projections having a cross section showing a domed curve shape in the inside of the vessel.

In this case, a transparent semi-cylindrical column plays just a part of a semi-circular lens to form one transparent line in a semi-cylindrical column direction. Accordingly, it is a matter of course that the semi-cylindrical column does not have to be strictly semi-circular, and it can be a semi-circular column.

The plural lines have been employed since they are effective for accelerating and facilitating the visibility and play a synergistic role.

In the water base, the radius (R) of the semi-cylindrical column is effective in a range of 0.15 to 1.5 mm. In the oil base, the radius (R) of the semi-cylindrical column is effective in a range of 0.25 to 1.0 mm in both of a non-polar solvent system and a polar solvent system.

The narrow interval between the semi-cylindrical projections increases a power for holding a colored liquid such as ink in a dent formed in an intersectional part of the semi-cylindrical columns with the vessel wall, and the colored liquid held in this part narrows an area of the semi-cylindrical column and reduces an amount of transmitted light. Accordingly, the quick and easy visibility can not be expected.

On the other hand, the too large interval makes no difference from the vessel wall itself and causes an effect as a bundle of transparent lines which contributes to the visibility to be lost.

The ranges in which the interval between the semi-cylindrical columns is effective are 0.4 to 2.0 mm in the water base and 0.8 to 1.0 mm in the oil base.

The vessel does not have to be cylindrical and shall not be restricted thereto. Even if the vessel is curved, it shall be sufficient that the semi-cylindrical columns are held in a face parallel to a required direction and the plural lines are disposed parallel to the face described above.

Shown in Fig. 1 is a horizontal cross section showing the plural semi-cylindrical projections 1 of the present invention provided in the inner face of the cylindrical ink reservoir 3. The numeral 2 shows an intersection interval of the semi-cylindrical projections with the vessel wall.

Fig. 2 is an elevation seen from an A-A line cross section in Fig. 1 and shows the semi-cylindrical projections provided in the inner face of the ink reservoir. An obliquely lined part 2 is the original inner wall of the cylindrical ink reservoir.

The use of the colored liquid vessel of the present invention has caused the visibility of the residual amount face of the liquid such as ink to be revealed very clearly even when a wettability of the vessel wall contacted has been changed to a large extent in the case where a surface tension of the liquid is extremely low and liquids other than water are used as a solvent or a dispersion medium or in the case where various synthetic resins other than glass are used for the vessel.

EXAMPLES

The present invention shall further specifically be explained below with reference to examples but the present invention shall by no means be restricted by these examples.

Example I

A radius R of plural semi-cylindrical projections provided in the inner face of an ink bottle molded from a transparent polypropylene resin (J-952 manufactured by Grand Polymer Co., Ltd.) was changed to 0.1, 0.15, 0.25, 0.5, 1.0, 1.5 and 2.0 mm, and the interval thereof was changed to 0.3, 0.4, 0.8, 1.0, 1.5, 2.0 and 2.5 to prepare the ink bottles. The visibilities for residual amounts (level position) of a water base opaque liquid and polar and non-polar solvent base opaque liquids were determined, and the results thereof are shown in Table 1.

The visibilities of the water base opaque liquids (inks) are shown on a left side of a column of the respective semi-circular projection radii R corresponding to the respective intervals, and the visibilities of the polar and non-polar solvent base opaque liquids (inks) on the right side, wherein the visibility is shown by a mark of ○ or ×:

○: good
×: inferior

Table 1

	Radius R of semi-cylindrical projection						
Interval	0.1	0.15	0.25	0.5	1.0	1.5	2.0
0.3 mm	× ×	× ×	× ×	× ×	× ×	× ×	× ×
0.4 mm	× ×	○ ×	○ ×	○ ×	○ ×	○ ×	× ×
0.8 mm	× ×	○ ×	○ ○	○ ○	○ ○	○ ×	× ×
1.0 mm	× ×	○ ×	○ ○	○ ○	○ ○	○ ×	× ×
1.5 mm	× ×	○ ×	○ ○	○ ○	○ ○	○ ×	× ×

Table 1 (continued)

	Radius R of semi-cylindrical projection						
Interval	0.1	0.15	0.25	0.5	1.0	1.5	2.0
2.0 mm	××	○×	○○	○○	○○	○×	××
2.5 mm	××	××	××	××	××	××	××

Remarks:
Left side in the column: water base opaque liquid
Right side in the column: polar and non-polar solvent base opaque liquids
○: good
×: inferior

Example II

A water base opaque liquid ink (1), a polar solvent base opaque liquid ink (2) and a non-polar solvent base opaque liquid ink (3) each having the following composition were put into the ink vessels produced from the respective resins shown in Table 2 to test use aptitude of the respective water base, polar organic solvent base and non-polar organic solvent base liquids for the resins used for the vessels. The results thereof are shown in Table 2.

(1) Water base opaque liquid ink composition		
(i)	Direct trisazo dye	20 parts
	Ethylene glycol	20
	Glycerin	5
	Purified water	55
(ii)	Carbon black pigment	20 parts
	Ethylene glycol	20
	Surfactant	3
	Glycerin	5
	Purified water	52

(2) Polar solvent base opaque ink composition		
(i)	Black dye (oil soluble monoazo dye)	12 parts
	Ketone resin	13
	Ethanol	73
	Higher fatty acid ester	2
(ii)	Carbon black pigment	5 parts
	Butyral resin	5
	Higher fatty acid ester	10
	Ethanol	80

(3) Non-polar solvent base opaque ink composition

(i) Titanium dioxide	35 parts
Alkyd base resin	7
Rosin ester base resin	15

	Surfactant	2
	Xylene	41
(ii)	Black dye (nigrosine)	12 parts
	Rosin ester base resin	13
	Oleic acid	3
	Xylene	72

Table 2

	Kind of ink		
Material resin for vessel	Water base (1)	Polar solvent base (2)	Non-polar solvent base (3)
Acrylic base resin	○	×	×
Styrene base resin	○	×	×
Polycarbonate base resin	○	×	×
Polyester base resin	○	○	Δ
Polypropylene base resin	○	○	Δ
Polyethylene base resin	○	○	○
Polyamide base resin	×	○	○
Polyallylate base resin	○	×	×
Explanation on marks: ○: Usable Δ: Usable for short period ×: Unusable			

Claims

1. A vessel provided with visibility for a residual amount of a colored liquid, wherein plural lines of ridge-shaped transparent projections having a cross section showing a domed curve are disposed parallel at intervals in the inside of the transparent vessel containing an opaque liquid in a direction in which the residual amount of the liquid has to be confirmed.

2. The vessel provided with visibility for a residual amount of a colored liquid as described in claim 1, wherein the ridge-shaped projections are semi-cylindrical; a radius (R) thereof falls in a range of 0.15 to 1.5 mm; and intervals at which the projections are disposed parallel fall in a range of 0.4 to 2.0 mm in terms of an intersectional interval of the semi-cylindrical projections with the inner wall of the vessel.

3. The vessel provided with visibility for a residual amount of a colored liquid as described in claim 1, wherein the ridge-shaped projections are semi-cylindrical; the radius (R) thereof falls in a range of 0.25 to 1.0 mm; and the intervals at which the projections are disposed parallel fall in a range of 0.8 to 1.0 mm in terms of an intersectional interval of the semi-cylindrical projections with the inner wall of the vessel.

4. The vessel provided with visibility for a residual amount of a colored liquid as described in any of claims 1 to 3, wherein when the liquid is of a water base, used as a material resin for the vessel is at least one selected from the group consisting of an acryl base resin, a styrene base resin, a polycarbonate base resin, a polyester base resin, a polypropylene base resin, a polyethylene base resin and a polyallylate base resin; when the liquid is of a polar organic solvent base, used as a material resin for the vessel is at least one selected from the group consisting

of a polyester base resin, a polypropylene base resin, a polyethylene base resin and a polyamide base resin; and when the liquid is of a non-polar organic solvent base, used as a material resin for the vessel is at least one selected from the group consisting of a polyethylene base resin and a polyamide base resin.

5. A vessel provided with visibility for a residual amount of a colored liquid, wherein transparent windows are formed in both of a part where a residual amount of the liquid contained in the vessel has to be detected and a through-vision part disposed oppositely thereto on the reverse side; and the structure as described in any of claims 1 to 3 is disposed in these window parts.

FIG.1

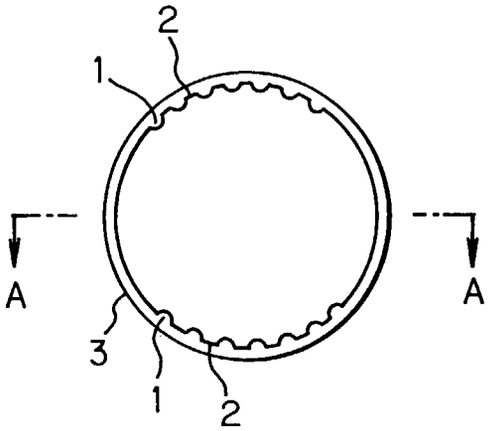
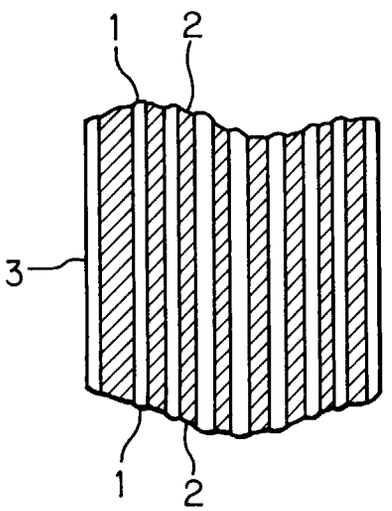


FIG.2



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EUROPEAN SEARCH REPORT

Application Number
EP 97 40 0275

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	DE 12 34 577 B (MONTBLANC-SIMPLO) * column 2, line 27 - column 3, line 14; figures 1-9 *	1	B43K5/12
Y		2-4	
X	WO 93 07008 A (STAEDTLER) * the whole document *	1	
Y		2-4	
A	DE 974 635 C (LAMY) * page 2, line 84 - page 3, line 17; figures *	5	
A	PATENT ABSTRACTS OF JAPAN vol. 095, no. 008, 29 September 1995 & JP 07 117392 A (TOMBOW PENCIL CO LTD), 9 May 1995, * abstract *	4	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B43K
A47G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 May 1997	Perney, Y

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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