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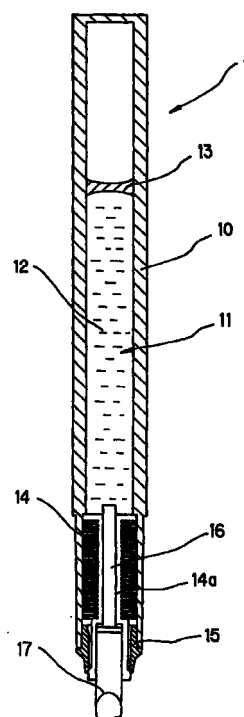
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(54) **WRITING INSTRUMENT**

(57) Provided is a writing instrument having an ink tank part for storing ink, wherein an ink 11 contained in the ink tank part 31 comprises an ink component 12 and a layer-separative component 13 which separates to be a layer from the ink component 12; both of a specific gravity and a surface tension of the layer-separative component 13 are smaller than those of the ink component 12; and the ink 11 can freely move in the ink tank part 10.

This provides a writing instrument and a liquid applicator which are excellent in visibility of an ink-remaining amount.

FIG. 1



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Description

Technical Field

5 **[0001]** The present invention relates to a writing instrument having an ink tank part for storing ink, more specifically to a writing instrument of a free ink type in which an ink contained in an ink tank part is directly fed to a pen tip or a writing instrument equipped with an ink tank part of a cartridge type for storing ink and a liquid applicator equipped with a tank part of a cartridge type for storing coating liquid, wherein visibility of an ink-remaining amount or a coating liquid-remaining amount is excellent.

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Background Art

[0002] In general, it can be given as one of the characteristics of a writing instrument of a free ink type that an ink-remaining amount can be observed (visibility). That is, in a free ink type writing instrument, an ink is filled in an ink tank which is a holder part, and the ink freely moves in the ink tank; and when the pen tip is turned downward, the ink-remaining amount can be observed through a visible part of the holder part.

15 **[0003]** At present, polypropylene which is excellent in transparency and solvent resistance and which has a good moldability is used for a holder part of a writing instrument of a free ink type since the visibility can be secured. Known as a method for improving this visibility is a method in which an ink-repellence property is improved by making a rib-like projection or by providing surface treatment such as fluorine treatment and silicone treatment on the inside of the holder part.

20 **[0004]** However, the preceding method in which an ink-repellence property is improved by a rib-like projection involves the problem that the process becomes complicated by needing a complicated die shape. Further, even those which are improved in ink-repellence property by the rib-like projection described above or which are subjected to surface treatment such as fluorine treatment and silicone treatment are still unsatisfactory in visibility. In particular, a free ink type writing instrument filled with an ink of a dark color such as black and blue is inferior in ink-repellence property and still has a problem in visibility, and the existing state is that no ones which are excellent in visibility are available as a matter of fact.

25 **[0005]** On the other hand, known in Japanese Utility Model Publication no. 53902/1991 discloses a transparent or translucent ink reservoir of a writing instrument, in which the material thereof comprises polyethylene or polypropylene and a water-based ink is used and in which a greasy back leaking preventive (ink follower) incompatible with the water-based ink is disposed on an end of the water-based ink, wherein the above back leaking preventive comprises polybutene so that the water-based ink is less liable to be wet than the back leaking preventive against the ink reservoir in order to allow the water-based ink to come into contact with the back leaking preventive convexly at a central part of a contact face between the water-based ink and the back leaking preventive; and the water-based ink has less wetting against the ink reservoir than polybutene has.

30 **[0006]** However, an object and a technical concept described in this official gazette reside in an ink reservoir of a writing instrument, wherein a greasy back leaking preventive comprising polybutene which is incompatible with a water-based ink is filled in contact with the ink so that the ink does not leak from the ink reservoir; a boundary line between the ink and the back leaking preventive moves smoothly depending on a discharge amount of the ink in writing; the boundary line can always be observed from the outside of the ink reservoir; and the ink amount contained in the ink reservoir can certainly be observed. The writing instrument is different in view of object and constitution from a free ink type writing instrument having a structure in which an ink freely moves in a holder part doubling as an ink tank which is one embodiment of the present invention and in which the ink-remaining amount therein can be observed via a visible part of the holder part when turning the pen tip downward. Accordingly, the preceding greasy back leaking preventive comprising polybutene can not be applied to the ink comprising the above constitution.

35 **[0007]** Also, a lot of writing instruments in which a cartridge type is employed for an ink tank part for storing ink have so far been known (for example, Japanese Utility Model Application Laid-Open No 42070/1981).

40 **[0008]** In this writing instrument in which a cartridge type is employed for an ink tank part, when repeatedly used, writing is continued until the ink contained in the ink tank part is completely consumed and the drawn lines become blurred, and then the cartridge is exchanged with new one.

45 **[0009]** However, often brought about is the problem that even if exchanged with a new cartridge and used for writing, the ink discharge amount from the original pen tip is notably reduced to bring about a reduction in intensity of the drawn lines, so that the pen can not be used, and the existing situation is that satisfactory solving measures against this problem have not yet been proposed.

55 **[0010]** The cause of the problem described above is inferred to originate in that complete consumption of the ink allows the air to create a space in a pen feed which serves as a pen tip and coagulation of a pigment in the space part brings about clogging and that even if a new cartridge is installed, an ink discharge amount passing through the ink feed

is markedly controlled, so that the drawn line intensity is notably reduced.

[0011] Also, a liquid applicator in which a cartridge type is employed for a tank part storing coating liquid such as manicure liquid has the same problem as described above.

[0012] In view of the preceding problems of conventional writing instruments and liquid applicators of a free ink type and a cartridge type, the present invention is intended to solve these problems, and an object thereof is to provide a writing instrument of a free ink type or a liquid applicator which is excellent in visibility of an ink-remaining amount or a coating liquid-remaining amount, and to provide a writing instrument and a liquid applicator in which the time of exchange for an ink cartridge can surely be visually found and in which the original ink discharge amount can be maintained as it is even when exchanged with a new ink cartridge.

Disclosure of the Invention

[0013] Intensive investigations of the conventional respective problems described above continued by the present inventors have resulted in finding that a writing instrument and a liquid applicator which meet the object described above can be obtained by filling a component having specific physical properties in addition to an ink component or a coating liquid component stored in an ink tank part, and hence the present invention has been completed.

[0014] That is, the present invention comprises the following items (1) to (7):

(1) A writing instrument having an ink tank part for storing ink, wherein the ink contained in the ink tank part comprises an ink component and a layer-separative component which separates to be a layer from the above ink component; both of a specific gravity and a surface tension of the above layer-separative component are smaller than those of the ink component; and the ink can freely move in the ink tank.

(2) The writing instrument as described in the above item (1), wherein the writing instrument described above is of a free ink type and equipped with a visible part for observing an ink-remaining amount in a holder part doubling as the ink tank part.

(3) The writing instrument as described in the above item (1), wherein the writing instrument described above is equipped with an ink tank part of a cartridge type for storing ink.

(4) The writing instrument as described in the above item (2), wherein the layer-separative component has a surface tension smaller than that of the visible part for observing an ink-remaining amount in the holder part doubling as the ink tank part.

(5) The writing instrument as described in any one of the above items (1) to (4), wherein the layer-separative component has a viscosity of 10000 mPa · s or less at 25°C.

(6) The writing instrument as described in any of the above items (1) to (6), wherein the ink component has a viscosity of 100 mPa · s or less at 25°C.

(7) A liquid applicator equipped with a tank part of a cartridge type for storing coating liquid, wherein the coating liquid contained in the tank part comprises a coating liquid component and a layer-separative component which separates to be a layer from the above coating liquid component; both of a specific gravity and a surface tension of the above layer-separative component are smaller than those of the coating liquid component; and the coating liquid can freely move in the tank.

[0015] In the present invention, a "writing instrument of a free ink type" means a writing instrument which has an ink tank for directly storing the ink without absorbing in a sliver and in which installed is an ink reservoir (collector member) for temporarily storing the ink pressed out from the ink tank when the air contained in the ink tank is expanded by a rise in the temperature so as to prevent the ink from blobbing from the pen tip or the air hole.

Brief Description of the Drawings

[0016]

Fig. 1 is an explanatory sectional view showing one example of an embodiment in which the free ink type writing instrument of the present invention is applied to a marking pen.

Fig. 2 (a) is an explanatory sectional view showing one example of an embodiment in which the free ink type writing instrument of the present is applied to a ball point pen, and (b) is an explanatory plan view showing the ink tank of (a).

Fig. 3 (a) and (b) are schematic explanatory drawings for schematically explaining the writing instrument of the present invention.

Fig. 4 is a cross section showing one example of the liquid applicator of the present invention in an exploded view.

Fig. 5 is a cross section showing a state in which the liquid applicator of Fig. 4 is set.

Fig. 6 is a cross section showing the writing instrument used in Example 7 and Comparative Example 7.

Best Mode for Carrying Out the Invention

5 [0017] Every and each embodiment of the present invention shall be explained below in detail with reference to attached drawings in order to explain the present invention in more details.

[0018] Fig. 1 and Fig. 2 are the embodiments of the writing instrument of a free ink type, Fig. 3 is the embodiment of the writing instrument equipped with an ink tank part of a cartridge type, and Fig. 4 and Fig. 5 are the embodiments of the liquid applicator equipped with a coating liquid tank part of a cartridge type.

10 [0019] Fig. 1 is one example of an embodiment in which the writing instrument of a free ink type is applied to a marking pen.

[0020] As shown in Fig. 1, the free ink type writing instrument A of the embodiment of the present invention is characterized in that an ink 11 contained in an ink tank part 10 which is a holder part comprises an ink component 12 and a layer-separative component 13 which separates to be a layer from the above ink component 12 and both of a specific gravity and a surface tension of the layer-separative component 13 are smaller than those of the ink component 12 and that the ink 11 can freely move in the ink tank part 10.

[0021] The numeral 14 in Fig. 1 is a collector member; 15 is a holder member; 16 is a feed; and 17 is a pen feed which serves as a pen tip. The ink is fed from the ink tank 10 into the pen feed 17 via the feed 16 having an ink passage disposed in a central hole 14a of the collector member 14.

20 [0022] In the present invention, the layer-separative component 13 is used for elevating visibility of a visible part in the holder part 10 doubling as the ink tank and shall not specifically be restricted as long as it satisfies conditions that the layer-separative component 13 has a smaller surface tension than that of the ink component 12 contained in the ink 11 and separate to be a layer without mixing with the ink component 12 and that it has a specific gravity smaller than that of the ink component 12.

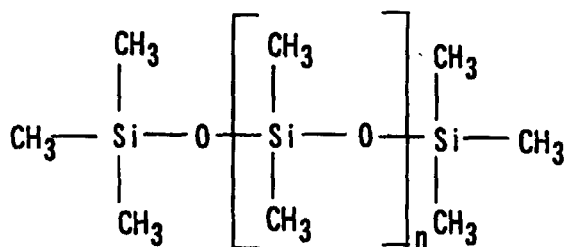
25 [0023] This layer-separative component 13 separates to be a layer without mixing with the ink component 12 and exerts no adverse effects on the physical properties of the ink component 12.

[0024] Even when the layer-separative component 13 has a surface tension larger than that of the visible part (in the present embodiment, the whole holder part serves as the visible part) in the holder part 10 doubling as the ink tank, it becomes easy to observe the ink remaining amount which is the object of the present invention, but the layer-separative component 13 has preferably a surface tension than smaller than that of the visible part (the whole holder part becomes the visible part) for observing the ink-remaining amount in the holder part 10 doubling as the ink tank. This layer-separative component makes it easier to observe the ink-remaining amount.

[0025] The layer-separative component 13 used in the present invention includes, for example, linear silicone oil having a dimethylsiloxane bond as a principal skeleton, cyclic silicone oil, modified silicone oil in which a part of the methyl group is modified with other functional groups (organic groups such as an amino group, an epoxy group, a carboxyl group, a carbinol group, a methacryl group, a mercapto group, an alkyl group, a higher fatty acid ester group, a higher alkoxy group, a fluorine group and a methylstyryl group) or a mixture obtained by mixing two or more kinds of hydrocarbon base liquid substances.

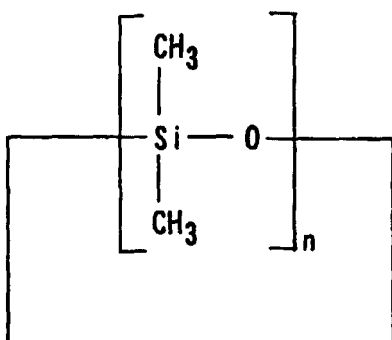
[0026] To be specific, capable of being used are linear silicone oil represented by the following formula (I), cyclic silicone oil represented by the following formula (II), modified silicone oil in which organic groups are introduced into side chains or both ends, or single end, side chains and both ends of polysiloxanes represented by the following formulas (III) to (VI) [amino-modified silicone oil, epoxy-modified silicone oil, carboxyl-modified silicone oil, carbinol-modified silicone oil, methacryl-modified silicone oil, mercapto-modified silicone oil, phenol-modified silicone oil, silicone oil modified with a reactive group at single end (single end carbinol-modified silicone oil, single end epoxy-modified silicone oil and single end methacryl-modified silicone oil), different functional groups-modified silicone oil (epoxy group/polyether group-modified silicone oil, amino group/polyether group-modified silicone oil and amino group/alkoxy group-modified silicone oil), polyether-modified silicone oil, methylstyryl-modified silicone oil, alkyl-modified silicone oil, higher fatty acid ester-modified silicone oil, hydrophilic group-modified silicone oil, higher alkoxy-modified silicone oil, higher fatty acid-modified silicone oil and fluorine-modified silicone oil], mineral oils (60, 100, 150, 300 and 500 neutral oils and bright stocks), synthetic oils such as poly- α -olefins (ethylene-propylene copolymers, polybutene, 1-octene oligomers and their hydrogenated compounds), alkylbenzene, alkylnaphthalene, polyalkylene glycols (polyethylene glycol and polypropylene glycol), diesters (di-2-ethylhexyl sebacate, diisooctyl adipate, dioctyl adipate, dioctyl sebacate, diisododecyl adipate and dibutyl adipate), polyol esters [trimethylolpropane ester, neopentyl glycol dipelargonate, pentaerythritol tetrapelargonate, di(isooctyl) azelate, bis(2,2-dimethyloctyl) azelate and bis(2,2-dimethylpentyl) 2,2,8,8-tetraethylazellate], phosphoric acid esters (tricresyl phosphate and the like), silanes (didodecyldioctylsilane and the like), silicic acid esters [hexa(2-ethylbutoxy)disiloxane and the like], polyphenyl ethers [m-bis(m-phenoxyphenoxy)benzene and bis(m-phenoxyphenyl)ether], fluorocarbons (chlorofluorocarbon and the like) and neopentylpolyol esters, castor oil, squalene, higher fatty acids (oleic acid, lauric acid, linoleic acid and linolenic acid), isostearic acid, isostearyl alcohol, branched

higher alcohols, polyglycerin esters, abocado oil, almond oil, olive oil, sesame oil, sasanqua oil, safflower oil, tsubaki oil, corn oil, rape oil, cottonseed oil, peanut oil, palm oil, coconut oil, vaseline, pristane, zamene, gazsen, polyetherester, squalane and mixtures of two or more kinds of hydrocarbon base oils such as liquid paraffin. Safety of use thereof has been confirmed.



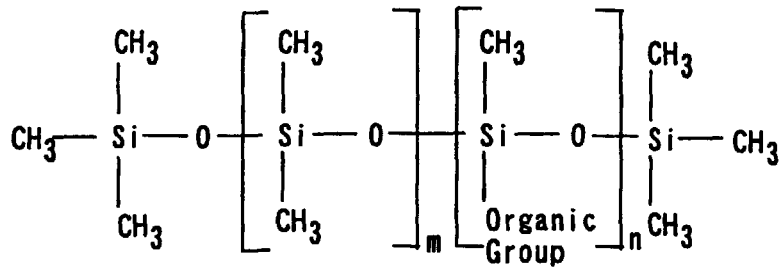
(I)

[n in the formula (I) is an integer of 0 to 2500]

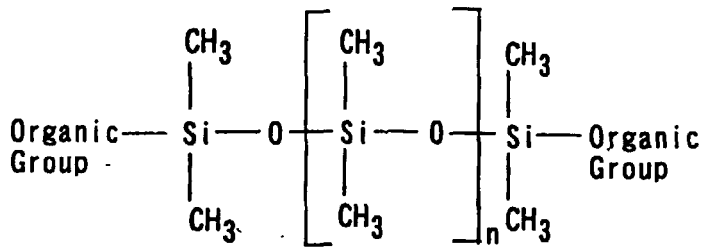


(II)

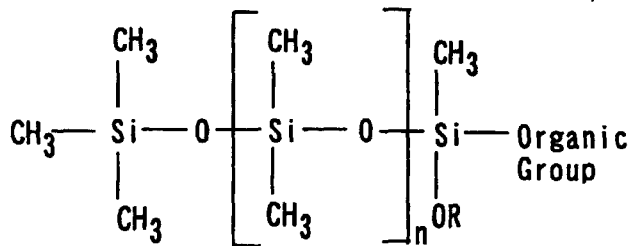
[n in the formula (II) is an integer of 3 to 6]



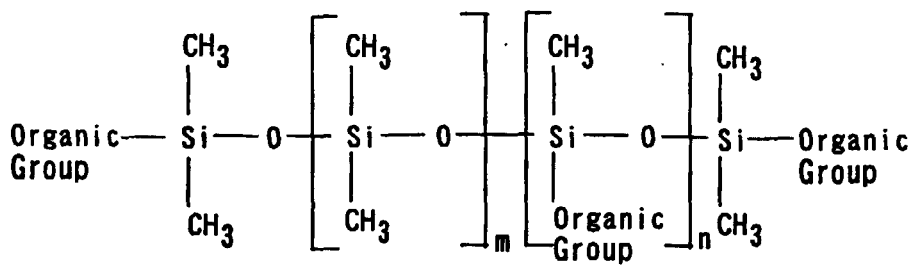
(III)



(IV)



(V)



(VI)

[0027] m and n described in the preceding formulas (III) to (VI) are integers of 0 or more, and m and n which are suitably settled are used respectively but restricted to those falling in a range where they function as the layer-separative component.

[0028] In particular, given as the preferred layer-separative component 13 are volatile ones considering that when the above layer-separative component 13 is discharged from the pen feed 17 of the free ink type writing instrument A (when it is lastly discharged after having consumed the ink component 12 contained in the ink tank 10 by writing), it

does not stain a paper surface and not remain there. It includes, for example, volatile linear silicone oil [in the case where n is 5 to 30 in the formula (I)] and volatile cyclic silicone oil (in the case where n is 3 to 4 in the formula (II)).

[0029] In the present invention, when the layer-separative component 13 has a surface tension larger than that of the ink component 12 contained in the ink 11, the layer-separative component can not be present between the ink tank member surface and the ink component, so that clear drain can not be carried out. Also, when the layer-separative component 13 has a specific gravity larger than that of the ink component 12, the layer-separative component 13 passes the pen feed through the feed and stays at the pen tip or is discharged on a writing surface in writing (normal writing with the pen tip turned downward), so that normal drawn lines can not be obtained in a certain case. Accordingly, it is not preferred.

[0030] Also, the layer-separative component 13 has a viscosity of 10000 mPa · s or less, preferably 1000 mPa · s or less and more preferably 30 mPa · s or less at 25°C.

[0031] If the viscosity exceeds 10000 mPa · s, it takes time to observe the ink-remaining amount, and it is difficult to observe the ink-remaining amount.

[0032] A use amount of the layer-separative component is 0.01 to 50 %, preferably 0.1 to 20 % and more preferably 1 to 10 % based on the content volume of the ink tank.

[0033] If the amount of the layer-separative component is less than 0.01 %, there is a spot where it can not be present between the ink tank member surface and the ink component, so that fine clear drain can not be carried out. On the other hand, if the amount of the layer-separative component exceeds 50 %, the layer-separative component comes out to a pen feed side through the feed in writing with the pen tip turned horizontal, and normal drawn lines can not be obtained in a certain case.

[0034] The ink component 12 of the present invention shall not specifically be restricted as long as it allows the layer-separative component 13 to separate to be a layer and functions as an ink component for a writing instrument. Capable of being used are, for example, so-called normal water-based inks and oil-based inks used for writing instruments prepared by dissolving or dispersing colorants comprising dyes and/or pigments, resins, dispersants, preservatives and other additives for a writing instrument in liquid obtained by mixing at least one of water, (purified water and ion-exchanged water) and organic solvents (1-methoxy-2-propanol, 1-ethoxy-2-propanol, benzyl alcohol, ethanol, ethylene glycol, carbitol, cellosolve, glycerin, diethylene glycol stearate, propylene glycol, 1-propanol, 2-propanol, 1-butanol, 2-butanol and t-butyl alcohol).

[0035] The ink component has a viscosity of 100 mPa · s or less, preferably 50 mPa · s or less and more preferably 10 mPa · s or less at 25°C.

[0036] If the ink component has a viscosity exceeding 100 mPa · s, brought about are the problems that not only movement thereof in the ink tank is deteriorated and it is difficult to observe the ink-remaining amount but also the ink followability in writing is notably degraded.

[0037] A material for the holder part which is the ink tank doubling as the visible part includes thermoplastic plastics which are transparent and can be injection-molded. To be specific, given as the examples thereof are polypropylene, polyethylene, polyethylene terephthalate, polystyrene, polyetherimide, polycarbonate, polysulfone, acrylonitrile-acrylate-styrene copolymers, acrylonitrile-styrene copolymers, butadiene-styrene-methacrylate terpolymers, ethylene-vinyl chloride copolymers, ethylene-vinyl alcohol copolymers, polymethylpentene and polyethersulfone.

[0038] Preferably selected are thermoplastic plastics which have a large surface tension against the ink component contained in the ink and the layer-separative component and which are not dissolved in the ink.

[0039] An inner surface of the visible part of the holder part which is the ink tank doubling as the visible part may be subjected to surface treatment with a fluororesin or a silicone resin to further improve the visibility.

[0040] In the free ink type writing instrument A of the embodiment of the present invention, the layer-separative component 13 having the characteristics described above allows the ink to be repelled in short time without remaining the ink component 12 in the ink tank 10 which is the visible part, and makes the visibility of the ink-remaining amount excellent very much.

[0041] Further, the free ink type writing instrument having excellent visibility of an ink-remaining amount is obtained just by charging the ink tank 10 with the ink 11 comprising the ink component 12 and the layer-separative component 13 having the characteristics described above, and the intended free ink type writing instrument can be produced without going through a conventional step of making a rib-like projection for improving visibility of an ink-remaining amount in an ink tank. Accordingly, the free ink type writing instrument which is excellent in productivity as well as in cost can be provided.

[0042] Fig. 2 (a) and (b) are explanatory drawings showing an embodiment in which the free ink type writing instrument is applied to a ball point pen.

[0043] The free ink type writing instrument B of the present invention is characterized in that an ink 21 contained in an ink tank part 20 which is a holder part comprises an ink component 22 and a layer-separative component 23 which separates to be a layer from the ink component 22 and both of a specific gravity and a surface tension of the above layer-separative component 23 are smaller than those of the ink component 22 and that the ink component 22 can

freely move in the holder part 20 doubling as the ink tank.

[0044] The layer-separative component 23 has a surface tension smaller than that of a visible part 20a for observing an ink-remaining amount in the holder part 20 doubling as the ink tank.

[0045] A coated film such as a coating film and a metal-deposited film is provided on the surface of the ink tank 20 excluding the visible part 20a described above to make the part opaque and invisible. Various ones described in details in the embodiment of the marking pen described above can be used for the ink tank 20 which is the holder part, the ink component 22 and the layer-separative component 23.

[0046] The numeral 24 in Fig. 2 is a collector member; 25 is a holder member; 26 is a feed comprising a leading feed 26a and an inner feed 26b; and 27 is a pen tip comprising a ball point tip. The ink 21 is derived from the ink tank 20 into the pen tip 27 via the feed 26 which comprises the leading feed 26a and the inner feed 26b and which is disposed in a central hole 24a of the collector member 24 and provided an ink passage.

[0047] In the free ink type writing instrument B of the embodiment of the present invention, the visible part 20a (another visible part having the same structure on a reverse side or an opposite side) is formed in a part of the ink tank 20. Even if this visible part 20a is a part of the ink tank 20, the layer-separative component 23 having the characteristics described above allows the ink to be repelled in short time without allowing the ink component to remain on the surface of the visible part 20a, and therefore it improves a clear drain property and makes the visibility of the ink-remaining amount excellent very much.

[0048] In particular, in the case that a visible part is formed in a part of an ink tank, even if an ink tank provided with a rib-like projection, a conventional free ink type writing instrument filled with an ink having a dark color such as black and blue is inferior in the ink-repellence property, and had a problem on the visibility thereof. In the present invention, however, even in the free ink type writing instrument filled with an ink having a dark color such as black and blue, the ink is repelled in short time without allowing the ink component to remain on the surface of the visible part 20a, and the visibility of the ink-remaining amount becomes excellent very much.

[0049] The free ink type writing instrument in the present invention shall not be restricted to the marking pen and the ball point pen of the embodiments described above and can be applied to a brush pen, a fountain pen, a felt type pen and an applicator for cosmetics.

[0050] Also, the free ink type writing instruments of the embodiments described above are characterized by the ink filled into the ink tank which comprises the ink component and the layer-separative component having the characteristics described above, and therefore a structure of a free ink type writing instrument shall not specifically be restricted excluding this constitution.

[0051] The free ink type writing instrument of the embodiment in the present invention is constituted as described above. The ink contained in the ink tank part comprises the ink component and the layer-separative component which separates to be a layer from the above ink component; both of a specific gravity and a surface tension of the above layer-separative component are smaller than those of the ink component; and the ink can freely move in the ink tank, so that the ink is repelled in short time without allowing the ink component to remain on the surface of the holder part, and the visibility of the ink-remaining amount becomes excellent very much.

[0052] If the layer-separative component has a surface tension smaller than that of the holder part (visible part) doubling as the ink tank, the visibility of the ink-remaining amount becomes excellent very much.

[0053] Further, the free ink type writing instrument having the excellent visibility of an ink remaining amount is obtained just by charging the ink tank with the ink comprising the ink component and the layer-separative component having the characteristics described above, and the free ink type writing instrument which is excellent in an aspect of productivity as well as cost is provided.

[0054] Fig. 3 is a schematic explanatory drawing for schematically explaining a writing instrument equipped with an ink tank of a cartridge type.

[0055] The cartridge type writing instrument C of the embodiment of the present invention is characterized, as shown in Fig. 3 (a), in that a writing instrument body 30 which is a holder is equipped with an ink tank part 31 of a detachable cartridge type and an ink 32 contained in the ink tank part 31 comprises an ink component 33 and a layer-separative component 34 which separate to be a layer from the ink component 33 and that both of a specific gravity and a surface tension of the layer-separative component 34 are smaller than those of the ink component 33 and the ink 32 can freely move in the ink tank 31.

[0056] A pen tip 35 comprising a pen feed is installed on a tip part of the writing instrument body 30.

[0057] The ink component 33 stored in the ink tank 31 described above shall not specifically be restricted and includes various components shown in the embodiment of the marking pen described above. The examples thereof include water-based inks comprising colorants comprising dyes and/or pigments, water, organic solvents and the like. Conventionally known additives such as a pH controlling agent, a dispersant, a preservative, a rust preventive and an auxiliary aye can suitably be added, if necessary, to these ink components.

[0058] Both of a specific gravity and a surface tension of the layer-separative component 34 stored in the ink tank part 31 together with the ink component 33 have to be smaller than those of the ink component 33, and the ink 32 has

to freely move in the ink tank part 31. Even if the ink component 33 is completely consumed by writing and the drawn line intensity is notably reduced, some amounts of the layer-separative component 34 has to still remain in the ink tank part 31.

[0059] The layer-separative component 34 requiring such as amount shall not specifically be restricted as long as it has the characteristics that both of a specific gravity and a surface tension thereof are smaller than those of the ink component 33 and that the ink can freely move in the ink tank part and includes, for example, various layer-separative components having the characteristics shown in the embodiment of the marking pen described above.

[0060] In this embodiment, materials to be used, sizes and forms of the pen tip part 35 and the ink tank part 31 of a cartridge type storing the ink 32 which comprises the ink component 33 and the layer-separative component 34 having the characteristics described above shall not specifically be restricted, and those shown in the embodiment of the marking pen described above can be used therefor. For example, a fiber bundle which is integrated with a pen tip, a synthetic resin-made pen tip having continuous pores and a small tube pen tip can suitably be used for the pen tip 35.

[0061] The writing instrument C of this embodiment thus constructed is so constituted that the ink 32 contained in the ink tank part 31 comprises the ink component 33 and the layer-separative component 34 which separates to be a layer from the ink component 33, and both of a specific gravity and a surface tension of the layer-separative component 34 are smaller than those of the ink component 33 and that the ink 32 can freely move in the ink tank 31, and therefore even if the ink component 33 contained in the ink tank part 31 is completely consumed by writing and the drawn line intensity is markedly reduced, the layer-separative component 34 is still contained, as shown in Fig. 3 (b), in the ink tank part 31, and the pen tip 35 is filled with the layer-separative component 34.

[0062] Accordingly, when the layer-separative component 34 is discharged from the pen tip 35, that is, when the drawn lines are written with the layer-separative component 34 in place of the ink component 33, the ink contained in the ink tank part 31 is completely consumed, which notifies (sign) the time to exchange the ink tank 31.

[0063] In this embodiment, even if the ink tank part 31 is exchanged with new one, a space is not formed in the pen tip part 35 by air or clogging is not caused in the space part by coagulation of a pigment contained in the ink component. Accordingly, the original ink discharge amount can be maintained as it is, and the original drawn line intensity can be maintained. Further, in this embodiment, the ink tank part 31 can repeatedly be exchanged until the pen tip part 35 itself is damaged to thereby bring about inferior writing. If the pen tip part 35 is a cartridge type, it can be exchanged together with the ink tank part 31 and used.

[0064] Fig. 4 and Fig. 5 are cross sections showing one example of the embodiment of the liquid applicator.

[0065] The liquid applicator D of this embodiment is composed of an applicator body 40 having an opened rear end, a tank part 50 of a cartridge type and a cylindrical plug 60. A coating liquid (not illustrated) stored in the tank part 50 described above comprises a coating liquid component such as a manicure liquid and a layer-separative component which separates to be a layer from the coating liquid component. Both of a specific gravity and a surface tension of the layer-separative component are smaller than those of the coating liquid component, and the coating liquid can freely move in the tank part 50. The numeral 45 is a cap.

[0066] In setting this liquid applicator D, the plug 60 is inserted, as shown in Fig. 4 and Fig. 5, to the rear end side of the tank part 50 of a cartridge type. In this case, a front end aperture part 67 of the plug 60 comes into contact with a stage part 54 of the tank part 50 of a cartridge type, and insertion of the plug 60 is stopped.

[0067] In this inserted state, the plug 60 is inserted into the inside of the applicator body 40 from the rear end aperture side thereof. This allows a concave engaging part 65 of the plug 60 to be engaged and fixed with a convex engaging part 42 of the applicator body 40 with narrowing a width of slits 64 while keeping a suitable gap between the peripheral face part having each slit 64 and the convex engaging part 42. At the same time, an aperture of an inner front axis 53 of the tank part 50 of a cartridge type is inserted into a pipe member 43 of the applicator body 40, and setting is completed.

[0068] Next, a way of using the liquid applicator D thus set shall be explained.

[0069] The tank part 50 of a cartridge type freely slides, as shown in Fig. 5, in an axis direction to the pipe part 43, and when the rear end of the tank part 50 is pressed forward, a valve part 52 of the tank part 50 is opened, and the coating liquid contained in the tank part 50 flows into the pipe member 43 through the valve part 52 and is fed into a brush member 41a.

[0070] When the rear end of the tank part 50 is released from pressing, the tank part 50 goes back against the pipe member 43 by virtue of a valve spring 52a built in the valve body 52 to shut the valve body 52. At the same time, in order to prevent the valve part 52 from falling from the pipe member 43 with the tank part 50 sliding to a plug 60 side at the time of pressing (knocking) the tank part 50 or applying careless force to it, the tank part 50 touches with the front end aperture part 67 of the plug 60 at the stage part 54 and stops.

[0071] In the liquid applicator D of this embodiment, a prescribed amount of the coating liquid is fed into the brush member 41a and used by repeating the pressing operation described above.

[0072] The coating liquid component stored in the tank described above shall not specifically be restricted and includes, for example, a liquid cosmetic such as a manicure liquid, a liquid detergent and a liquid chemical.

[0073] Both of a specific gravity and a surface tension of the layer-separative component stored in the tank part 50 together with the coating liquid component have to be smaller than those of the coating liquid component, and the coating liquid has to freely move in the tank. Further, even if the coating liquid component is completely consumed by coating and the coating density is notably reduced, some amounts of the layer-separative component has to still remain in the ink tank part 50.

[0074] The layer-separative component requiring such an amount shall not specifically be restricted as long as it has the characteristics that both of a specific gravity and a surface tension thereof are smaller than those of the coating liquid component and that the coating liquid can freely move in the ink tank part and includes, for example, various layer-separative components having the characteristics shown in the embodiment of the marking pen described above. The liquid applicator D of this embodiment thus constituted has the same working effects as those of the writing instrument C. When the layer-separative component is discharged from the brush member 41a, that is, when the coated lines are coated with the layer-separative component having the characteristic described above in place of the coating liquid component, the coating liquid contained in the tank part 50 is completely consumed, which notifies (sign) the time to exchange the tank part 50.

[0075] The preceding tank part 50 of a cartridge type can easily be exchanged by detaching the plug 60 from the applicator body 40 with releasing engagement thereof, then detaching the tank part 50 and setting a new tank according to the setting way described above.

[0076] In the writing instrument or the liquid applicator thus constituted each equipped with the ink tank part of a cartridge type for storing the preceding ink or coating liquid, the ink or the coating liquid stored in the tank part comprises the ink component or the coating liquid component such as a manicure liquid and the layer-separative component which separates to be a layer from the above ink component or coating liquid component. Both of a specific gravity and a surface tension of the layer-separative component are smaller than those of the ink component or the coating liquid component, and the ink or the coating liquid can freely move in the tank part, whereby the intended observation of the remaining amount of the ink or the coating liquid can simply and easily be achieved. Constitution other than that of the layer-separative component having the characteristic described above which is stored in the ink tank part shall not specifically be restricted.

[0077] The writing instrument of the embodiment described above which is equipped with the ink tank part of a cartridge type includes, for example, a felt tip pen, a ball point pen, a marking pen such as a marker for underlining and a fountain pen which are equipped with the ink tank parts of a cartridge type, and the embodiment can further be applied to a liquid applicator for various uses which is equipped with a tank part of a cartridge type storing a coating liquid.

Examples

[0078] Next, the present invention shall be explained in further details with reference to examples and comparative examples, but the present invention shall not be restricted to the examples described below.

[0079] Examples 1 to 7 and Comparative Examples 1 to 5 are examples and comparative examples for free ink type writing instruments, and Example 8 and Comparative Example 6 are an example and a comparative example for writing instruments equipped with an ink tank of a cartridge type.

Example 1

[0080] Used was an ink tank with a content volume of 2.0 cc shown in Fig. 1, which had a smooth surface having no form of a rib in a visible part of an inside of the ink tank.

[0081] Polypropylene (PP) having a surface tension of 32 dyn/cm (at 25°C) was used for the material thereof.

Ink composition:

[0082]

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(1) Ink component composition	(% by weight)
Purified water	55.0
Propylene glycol	17.0
Glycerin	5.0
Preservative (1,2-benzisothiazoline-3-one)	0.3
Resin (acryl base emulsion)	7.0
Dispersant (styrene-acryl base dispersion resin)	0.7
Carbon black	15.0
Surface tension	35 dyn/cm (at 25°C)
Specific gravity	1.07 (at 25°C)
Viscosity	4.5 mPa • s (at 25°C)
(2) Decamethylcyclopentasiloxane (KF995: manufactured by Shin-Etsu Chemical Co., Ltd.) was used for a layer-separative component.	
Surface tension	17.8 dyn/cm (at 25°C)
Specific gravity	0.956 (at 25°C)
Viscosity	3.8 mPa • s (at 25°C)

[0083] The ink tank was charged with 1.5 cc of the ink component described above and 0.1 cc of the layer-separative component so that the visible part was completely covered with the ink component. This was assembled into such a writing instrument as shown in Fig. 1 to carry out a test of visibility according to the following method (test of visibility).

[0084] With respect to the test method of visibility, the pen tip is turned downward to cover the visible part with the ink component. Then, the pen tip is turned upward so that the ink component stays in a lower position than the visible part.

[0085] In this case, determined was time spent until the ink was repelled in the visible part and the ink-remaining amount could be observed, whereby the performance of the visibility was evaluated. The result thereof is shown in the following Table 1.

Example 2

[0086] Used was an ink tank with a content volume of 2.0 cc shown in Fig. 1, which had a smooth surface having no form of a rib in a visible part of an inside of the ink tank.

[0087] Polypropylene (PP) having a surface tension of 32 dyn/cm (at 25°C) was used for the material thereof.

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Ink composition:

[0088]

(1) Ink component composition	(% by weight)
Propylene glycol monomethyl ether	80.0
Resin (alkylphenol resin)	7.0
Dye (black)	13.0
Surface tension	24 dyn/cm (at 25°C)
Specific gravity	0.950 (at 25°C)
Viscosity	4.7 mPa • s (at 25°C)
(2) Dimethylsilicone oil (KF96-10: manufactured by Shin-Etsu Chemical Co., Ltd.) was used for a layer-separative component.	
Surface tension	20.0 dyn/cm (at 25°C)
Specific gravity	0.940 (at 25°C)
Viscosity	9.4 mPa • s (at 25°C)

[0089] The ink tank was charged with 1.5 cc of the ink component described above and 0.1 cc of the layer-separative component so that the visible part was completely covered with the ink component. This was assembled into such a writing instrument as shown in Fig. 1 to carry out the test of visibility according to the same method as in Example 1 described above. The result thereof is shown in the following Table 1.

Example 3

[0090] Used was an ink tank with a content volume of 2.0 cc shown in Fig. 2, which had a smooth surface having no form of a rib in a visible part of an inside of the ink tank.

[0091] Polypropylene (PP) having a surface tension of 32 dyn/cm (at 25°C) was used for the material thereof.

Ink composition:

[0092]

(1) Ink component composition	(% by weight)
Purified water	55.0
Propylene glycol	17.0
Glycerin	5.0
Preservative (1,2-benzisothiazoline-3-one)	0.3
Resin (acryl base emulsion)	7.0
Dispersant (styrene-acryl base dispersion resin)	0.7
Carbon black	15.0
Surface tension	35 dyn/cm (at 25°C)
Specific gravity	1.07 (at 25°C)
Viscosity	4.5 mPa • s (at 25°C)
(2) α -Olefin oligomer (hydrocarbon oil, SHF-20: manufactured by Mobil Sekiyu K.K.) was used for a layer-separative component.	
Surface tension	27.2 dyn/cm (at 25°C)
Specific gravity	0.80 (at 25°C)
Viscosity	6.5 mPa • s (at 25°C)

[0093] The ink tank was charged with 1.5 cc of the ink component described above and 0.1 cc of the layer-separative component so that the visible part was completely covered with the color component. This was assembled into such a writing instrument as shown in Fig. 2 to carry out the test of visibility according to the same method as in Example 1 described above. The result thereof is shown in the following Table 1.

Example 4

[0094] Used was an ink tank with a content volume of 2.0 cc shown in Fig. 1, which had a smooth surface having no form of a rib in a visible part of an inside of the ink tank.

[0095] Polypropylene (PP) having a surface tension of 32 dyn/cm (at 25°C) was used for the material thereof.

Ink composition:

[0096]

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(1) Ink component composition	(% by weight)
Purified water	55.0
Propylene glycol	17.0
Glycerin	5.0
Preservative (1,2-benzisothiazoline-3-one)	0.3
Resin (acryl base emulsion)	7.0
Dispersant (styrene-acryl base dispersion resin)	0.7
Carbon black	15.0
Surface tension	35 dyn/cm (at 25°C)
Specific gravity	1.07 (at 25°C)
Viscosity	4.5 mPa • s (at 25°C)
(2) Layer-separative component composition	(% by weight)
α -Olefin oligomer (hydrocarbon oil, SHF-20: manufactured by Mobil Sekiyu K.K.)	98.0
Dimethylsilicone oil (KF96-10000: manufactured by Shin-Etsu Chemical Co., Ltd.)	2.0
Surface tension	22.0 dyn/cm (at 25°C)
Specific gravity	0.805 (at 25°C)
Viscosity	6.0 mPa • s (at 25°C)

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[0097] The ink tank was charged with 1.5 cc of the ink component described above and 0.1 cc of the layer-separative component comprising the two components described above so that the visible part was completely covered with the ink component. This was assembled into such a writing instrument as shown in Fig. 1 to carry out the test of visibility according to the same method as in Example 1 described above. The result thereof is shown in the following Table 1.

Example 5

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[0098] Used was an ink tank with a content volume of 2.0 cc shown in Fig. 1, which had a smooth surface having no form of a rib in a visible part of an inside of the ink tank.

[0099] Polypropylene (PP) having a surface tension of 32 dyn/cm (at 25°C) was used for the material thereof.

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Ink composition:

[0100]

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(1) Ink component composition		(% by weight)
Propylene glycol monomethyl ether		80.0
Resin (alkylphenol resin)		7.0
Dye (black)		13.0
Surface tension		24 dyn/cm (at 25°C)
Specific gravity		0.950 (at 25°C)
Viscosity		4.7 mPa • s (at 25°C)
(2) Layer-separative component composition		(% by weight)
Liquid paraffin (first class reagent, manufactured by Wako Pure Chemical Industries, Ltd.)		99.0
Dimethylsilicone oil (KF96-50000: manufactured by Shin-Etsu Chemical Co., Ltd.)		1.0
Surface tension		21.9 dyn/cm (at 25°C)
Specific gravity		0.900 (at 25°C)
Viscosity		110 mPa • s (at 25°C)

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[0101] The ink tank was charged with 1.5 cc of the ink component described above and 0.1 cc of the layer-separative component comprising the two components described above so that the visible part was completely covered with the ink component. This was assembled into such a writing instrument as shown in Fig. 1 to carry out the test of visibility according to the same method as in Example 1 described above. The result thereof is shown in the following Table 1.

Example 6

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[0102] Used was an ink tank with a content volume of 2.0 cc shown in Fig. 1, which had a smooth surface having no form of a rib in a visible part of an inside of the ink tank.

[0103] Polypropylene (PP) which did not contain an antioxidant, a light degradation preventive and an antistatic agent and which had a surface tension of 28 dyn/cm (at 25°C) was used for the material thereof.

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Ink composition:

[0104]

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(1) Ink component composition	(% by weight)
Purified water	55.0
Propylene glycol	17.0
Glycerin	5.0
Preservative (1,2-benzisothiazoline-3-one)	0.3
Resin (acryl base emulsion)	7.0
Dispersant (styrene-acryl base dispersion resin)	0.7
Carbon black	15.0
Surface tension	35 dyn/cm (at 25°C)
Specific gravity	1.07 (at 25°C)
Viscosity	4.5 mPa • s (at 25°C)
(2) Liquid paraffin 100 % by weight (first class reagent, manufactured by Wako Pure Chemical Industries, Ltd.) was used for a layer-separative component.	
Surface tension	30.5 dyn/cm (at 25°C)
Specific gravity	0.870 (at 25°C)
Viscosity	105 mPa • s (at 25°C)

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[0105] The ink tank was charged with 1.5 cc of the ink component described above and 0.1 cc of the layer-separative component so that the visible part was completely covered with the color component. This was assembled into such a writing instrument as shown in Fig. 1 to carry out the test of visibility according to the same method as in Example 1 described above. The result thereof is shown in the following Table 1.

Comparative Example 1

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[0106] In Example 1 described above, a writing instrument excluding the layer-separative component was assembled to carry out the test of visibility according to the same method as in Example 1 described above. The result thereof is shown in the following Table 1.

Comparative Example 2

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[0107] In Example 2 described above, a writing instrument excluding the layer-separative component was assembled to carry out the test of visibility according to the same method as in Example 1 described above. The result thereof is shown in the following Table 1.

Comparative Example 3

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[0108] In Example 3 described above, a writing instrument excluding the layer-separative component was assembled to carry out the test of visibility according to the same method as in Example 1 described above. The result thereof is shown in the following Table 1.

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Comparative Example 4

[0109] Used was an ink tank with a content volume of 2.0 cc shown in Fig. 1, which had a smooth surface having no form of a rib in a visible part of an inside of the ink tank.

[0110] Used for the material thereof was polypropylene (PP) in which a fluoro resin (fluorine base coating agent: Fluorad FC-722, manufactured by Sumitomo 3M Limited) was coated on the surface of the visible part of the inside of the ink tank and which had a surface tension of 12 dyn/cm (at 25°C).

[0111] The same ink composition as in Example 3 was used. That is, the surface tension was 35 dyn/cm (at 25°C); the specific gravity was 1.07 (at 25°C); and the viscosity was 4.5 mPa • s (at 25°C).

[0112] The ink tank was charged with 1.5 cc of the ink component described above so that the visible part was completely covered with the color component. This was assembled into such a writing instrument as shown in Fig. 1 to carry out the test of visibility according to the same method as in Example 1 described above. The result thereof is shown in the following Table 1.

Comparative Example 5

[0113] Used was an ink tank with a content volume of 2.0 cc shown in Fig. 1, which had a smooth surface having no form of a rib in a visible part of an inside of the ink tank.

[0114] Used for the material thereof was polypropylene (PP) in which a fluoro resin (fluorine base coating agent: Fluorad FC-722, manufactured by Sumitomo 3M Limited) was coated on the surface of the visible part of the inside of the ink tank and which had a surface tension of 12 dyn/cm (at 25°C).

[0115] The same ink composition as in Example 2 was used. That is, the surface tension was 24 dyn/cm (at 25°C); the specific gravity was 0.950 (at 25°C); and the viscosity was 4.7 mPa • s (at 25°C).

[0116] The ink tank was charged with 1.5 cc of the ink component described above so that the visible part was completely covered with the color component. This was assembled into such a writing instrument as shown in Fig. 1 to carry out the test of visibility according to the same method as in Example 1 described above. The result thereof is shown in the following Table 1.

Comparative Example 6

[0117] In Example 6 described above, a writing instrument excluding the layer-separative component was assembled to carry out the test of visibility according to the same method as in Example 1 described above. The result thereof is shown in the following Table 1.

Table 1

	Time spent until ink-remaining amount can be observed
Example 1	one second or shorter
Example 2	one second or shorter
Example 3	one second or shorter
Example 4	one second or shorter
Example 5	3 seconds or shorter
Example 6	5 seconds or shorter
Comparative Example 1	5 minutes or longer
Comparative Example 2	20 minutes or longer
Comparative Example 3	5 minutes or longer
Comparative Example 4	5 minutes or longer*1
Comparative Example 5	20 minutes or longer*1
Comparative Example 6	one minute or longer

*1: in both cases, the time was 5 seconds or shorter in the beginning, but the coating film was peeled off from the inner wall face of the ink tank with the passage of time, and the effect was lost, which resulted in requiring each time described above until the ink-remaining amount could be observed.

[0118] As apparent from the results shown in Table 1, it has been found that the free ink type writing instruments containing the layer-separative components prepared in Examples 1 to 6 of the present invention are excellent very much in visibility of an ink-remaining amount as compared with the free ink type writing instruments containing no layer-separative components prepared in Comparative Examples 1 to 6.

[0119] Individually observing the examples, in Examples 1 to 6, the ink contained in the ink tank comprises the ink component and the layer-separative component which separates to be a layer from the ink component; both of a specific gravity and a surface tension of the layer-separative component are smaller than those of the ink component; and the ink can freely move in the ink tank. Accordingly, it can be found that the ink is excellent very much in visibility of an ink-remaining amount. Further continuing the analysis, in Examples 1 to 5, the layer-separative components have a surface tension smaller than that of the visible part for observing the ink-remaining amount of the holder part doubling as the ink tank, and in Example 6, the layer-separative component has a surface tension larger than that of the visible part for observing the ink-remaining amount of the holder part doubling as the ink tank. It can be found that the object of the present invention has been achieved in all these cases.

[0120] In contrast with this, Comparative Examples 1 to 6 relate to the free ink type writing instruments containing no layer-separative components. Particularly in Comparative Examples 4 and 5, the fluororesin was coated on the surface of the visible part of the inside of the ink tank. In these cases, the time until the ink-remaining amount can be observed was 5 seconds or shorter in the beginning, but the coating film was peeled off from the inner wall surface of the ink tank with the passage of time (after left standing for 5 days), and the effect was lost. After all, required were 5 minutes or longer in the case of Comparative Example 4 and 20 minutes or longer in the case of Comparative Example 5.

Example 7 and Comparative Example 7

[0121] A water-based ink (specific gravity: 1.07/25°C) having the following composition was used as an ink component in Example 7.

Ink component composition:

[0122]

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Color resin emulsion toner (yellow) (color emulsion particle size: 0.5 μm)	50.0 % by weight
Purified water	29.5 % by weight
Glycerin	20.0 % by weight
Preservative	0.5 % by weight
Surface tension	35 dyn/cm (at 25°C)
Specific gravity	1.07 (at 25°C)
Viscosity	5 mPa $\cdot$ s (at 25°C)

Layer-separative component:

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[0123]

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Decamethylcyclopentasiloxane (KF995: manufactured by Shin- Etsu Chemical Co., Ltd.) was used.	
Surface tension	17.8 dyn/cm (at 25°C)
Specific gravity	0.956 (at 25°C)
Viscosity	3.8 mPa $\cdot$ s (at 25°C)

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[0124] In Comparative Example 7, the same ink as in Example 7 was used, except that silicone oil was not added, and a test was carried out according to the following method.

[0125] A writing instrument shown in Fig. 6 was used for this test. The writing instrument E is equipped with an ink tank 70 doubling as a holder which is a cartridge part, and the ink tank 70 is detachably installed to a main body 71 via a connecting part 72. An ink 73 stored in the ink tank 70 is derived into a pen feed 75 via a feed 74. The numeral 76 is a collector member.

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Test method:

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[0126] The ink tank part 70 of a cartridge type was charged with 2.0 cc of the ink component and 0.2 cc of the layer-separative component each having the composition described above, respectively, and writing was carried out until the ink contained in the ink tank part 70 was completely consumed and the drawn line was blurred. Then, the cartridge was exchanged with a new ink tank cartridge filled with the ink component and the layer-separative component having the compositions described above, and writing was carried out again to visually observe the drawn line intensity and compare it with the original intensity. This operation was repeated 5 times.

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[0127] Observing the results of the test described above, in the case where the layer-separative component prepared in Example 7 was filled together with the ink component, a reduction in the drawn line intensity was not observed at all even after the ink tank cartridge was exchanged 5 times. In contrast with this, in the case where the layer-separative component was not filled together with the ink component in Comparative Example 7, a reduction in the drawn line intensity was already observed from second exchange, and a marked reduction in the intensity was brought about as a number of times for exchange of the ink tank cartridge was increased.

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Industrial Applicability

[0128] As described above, according to the present invention, there are provided a free ink type writing instrument

and a writing instrument equipped with an ink tank part of a cartridge type which are excellent in visibility of an ink-remaining amount.

[0129] Further, according to the writing instrument of the present invention, layer-separative component in which both of a specific gravity and a surface tension are smaller than those of the ink component and which separates to be a layer from the ink component is just stored in the ink tank part together with a conventional ink component, and therefore the writing instrument which is excellent in productivity and profitability is provided.

[0130] Further, in the writing instrument equipped with an ink tank part of a cartridge type, it has become possible to exchange any number of times a cartridge in the ink tank part, and even after the ink component is completely consumed, the state that the layer-separative component is filled in the inside of the pen tip such as the pen feed can be maintained. Further, when the ink component is completely consumed, the drawn line is written with the liquid of the layer-separative component in place of the ink component, and therefore the time for exchange of the ink tank part can surely be visually observed.

[0131] Further, according to the liquid applicator of the present invention, the time for exchange of the tank part of a cartridge type can surely be visually observed, and the original discharge amount of the coating liquid can be maintained as it is even after exchanged with a new tank part.

Claims

1. A writing instrument having an ink tank part for storing ink, wherein an ink contained in the ink tank part comprises an ink component and a layer-separative component which separates to be a layer from said ink component; both of a specific gravity and a surface tension of said layer-separative component are smaller than those of the ink component; and the ink can freely move in the ink tank part.
2. The writing instrument as described in claim 1, wherein the writing instrument is of a free ink type and equipped with a visible part for observing an ink-remaining amount in a holder part doubling as the ink tank part.
3. The writing instrument as described in claim 1, wherein the writing instrument is equipped with an ink tank part of a cartridge type for storing ink.
4. The writing instrument as described in claim 2, wherein the layer-separative component has a surface tension smaller than that of the visible part for observing an ink-remaining amount in the holder part doubling as the ink tank part.
5. The writing instrument as described in any one of claims 1 to 4, wherein the layer-separative component has a viscosity of 10000 mPa • s or less at 25°C.
6. The writing instrument as described in any one of claims 1 to 5, wherein the ink component has a viscosity of 100 mPa • s or less at 25°C.
7. A liquid applicator equipped with a tank part of a cartridge type for storing coating liquid, wherein a coating liquid contained in the tank part comprises a coating liquid component and a layer-separative component which separates to be a layer from the coating liquid component; both of a specific gravity and a surface tension of the layer-separative component are smaller than those of the coating liquid component; and the coating liquid can freely move in the tank.

FIG. 1

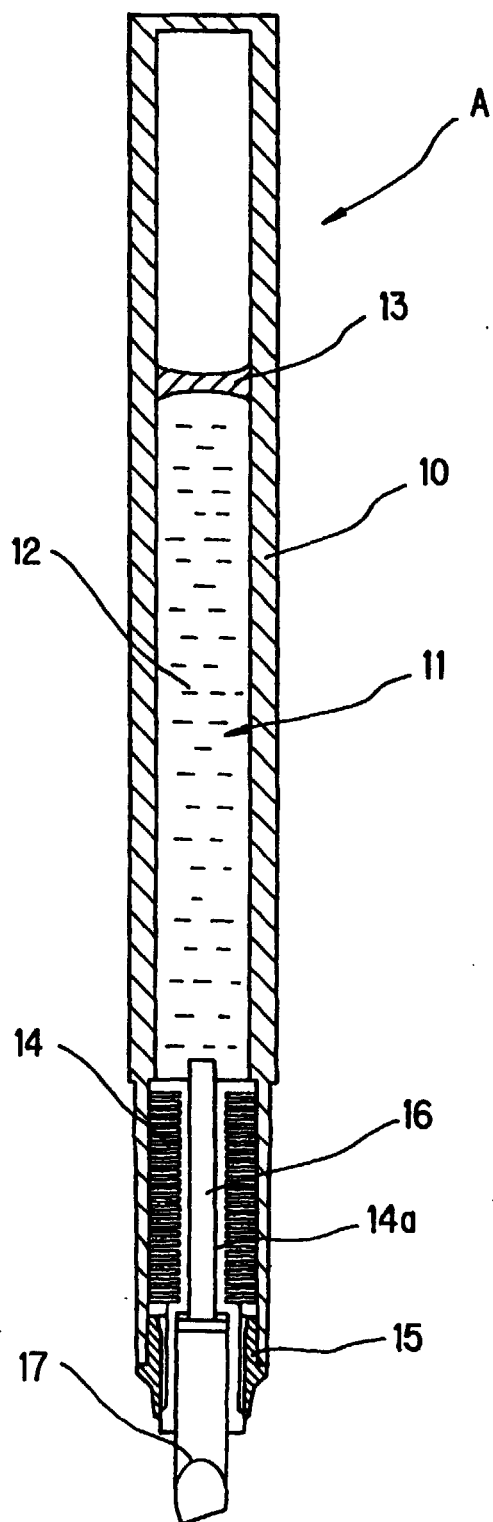


FIG. 2

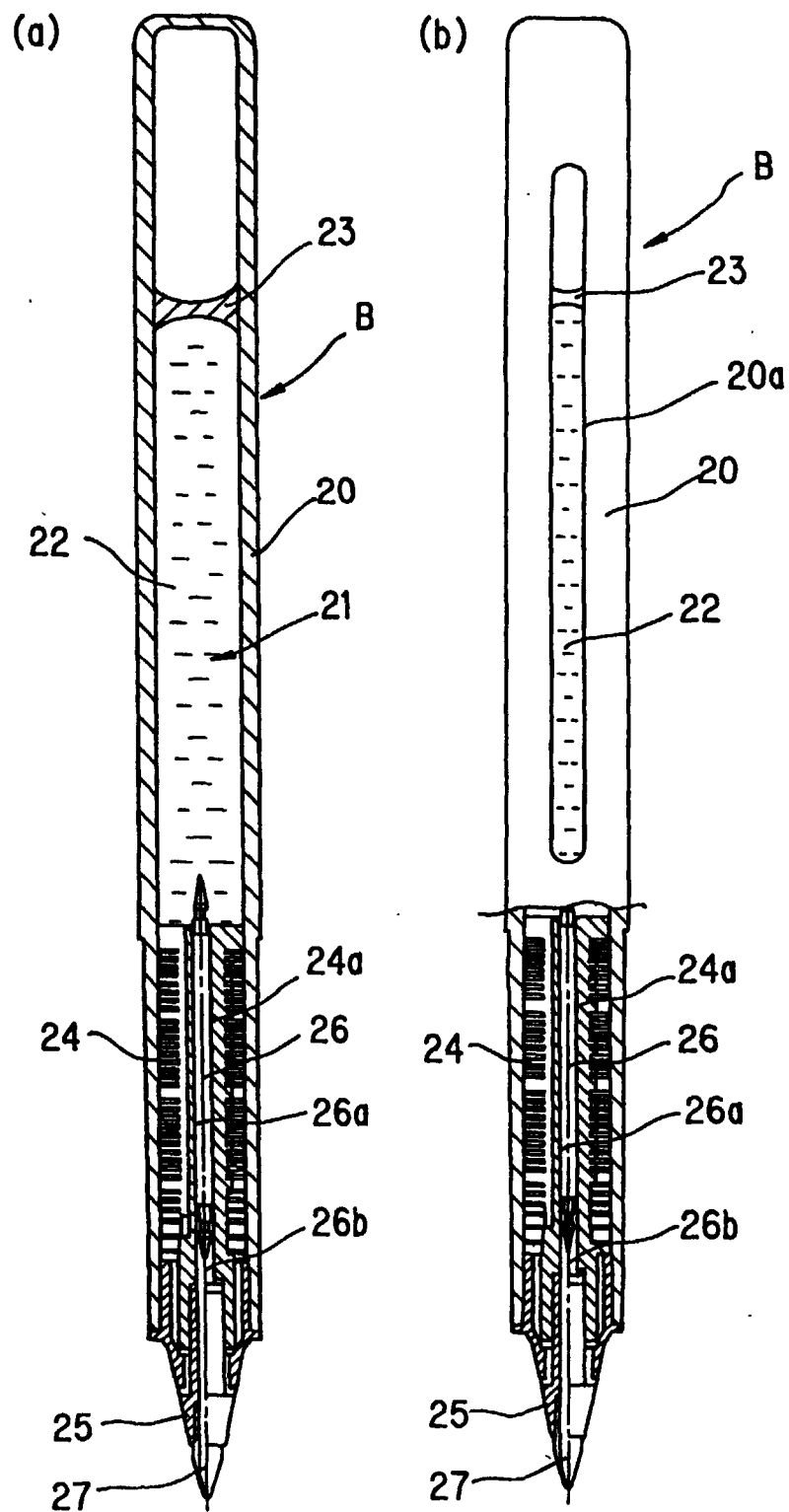


FIG. 3

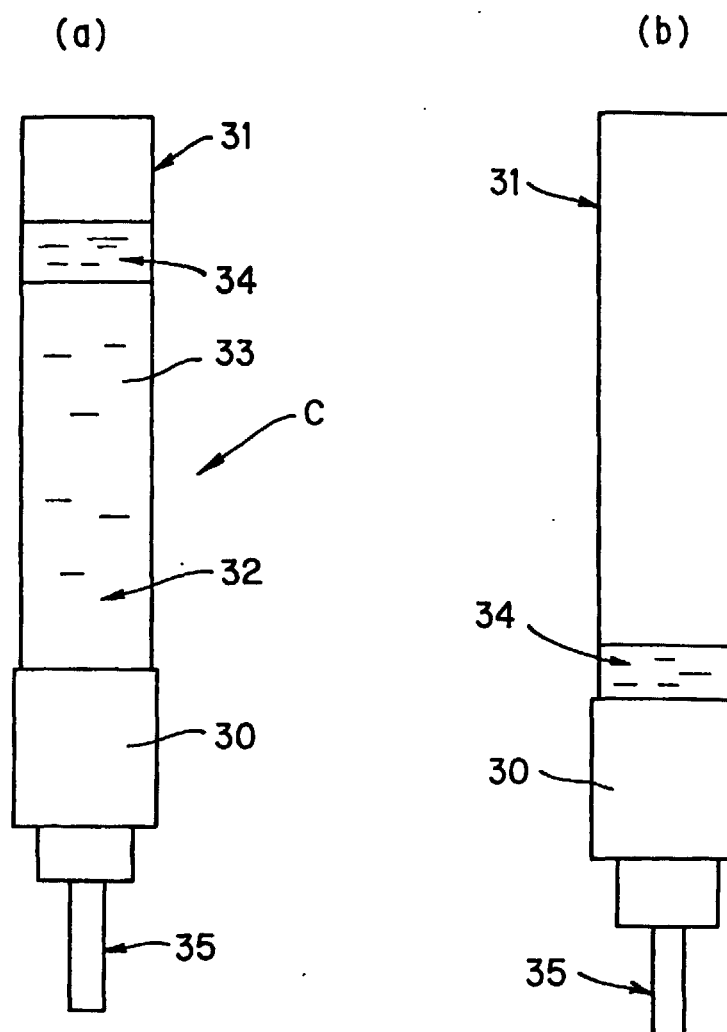


FIG. 4

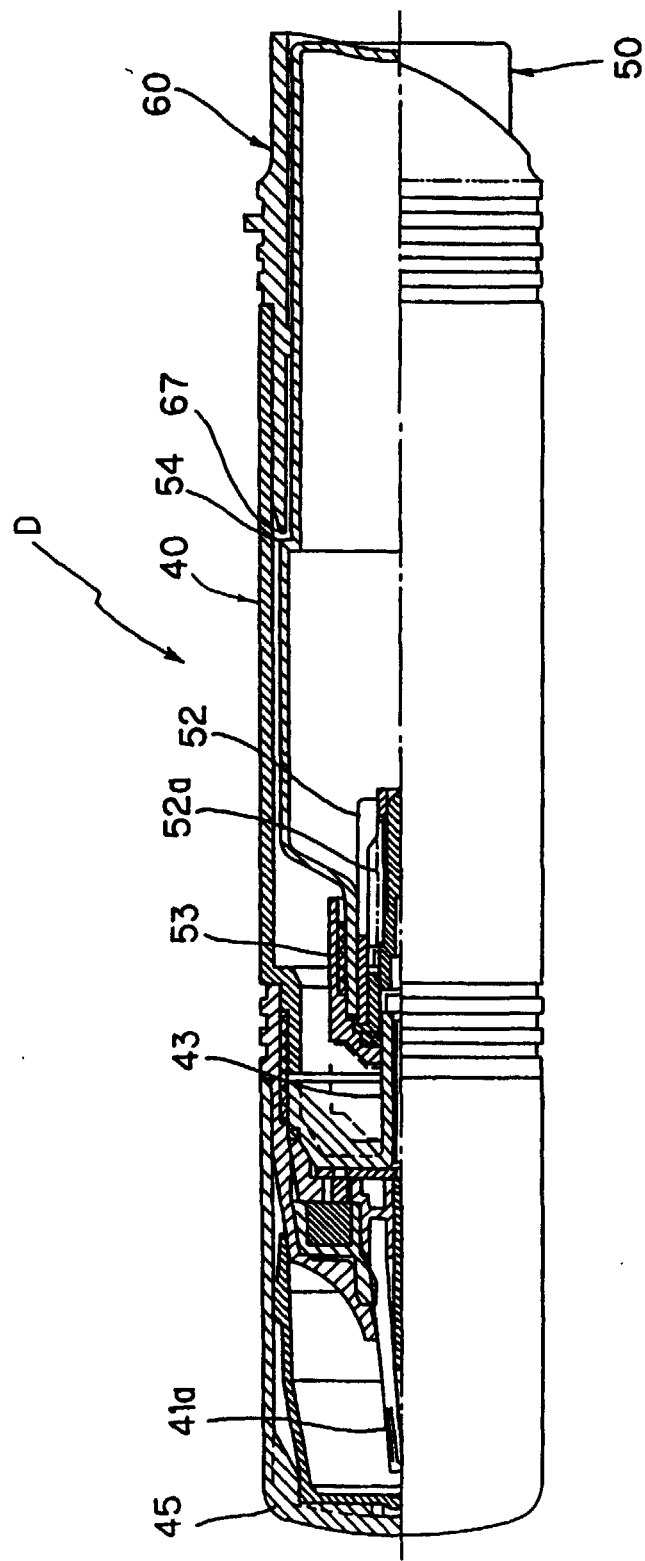


FIG. 5

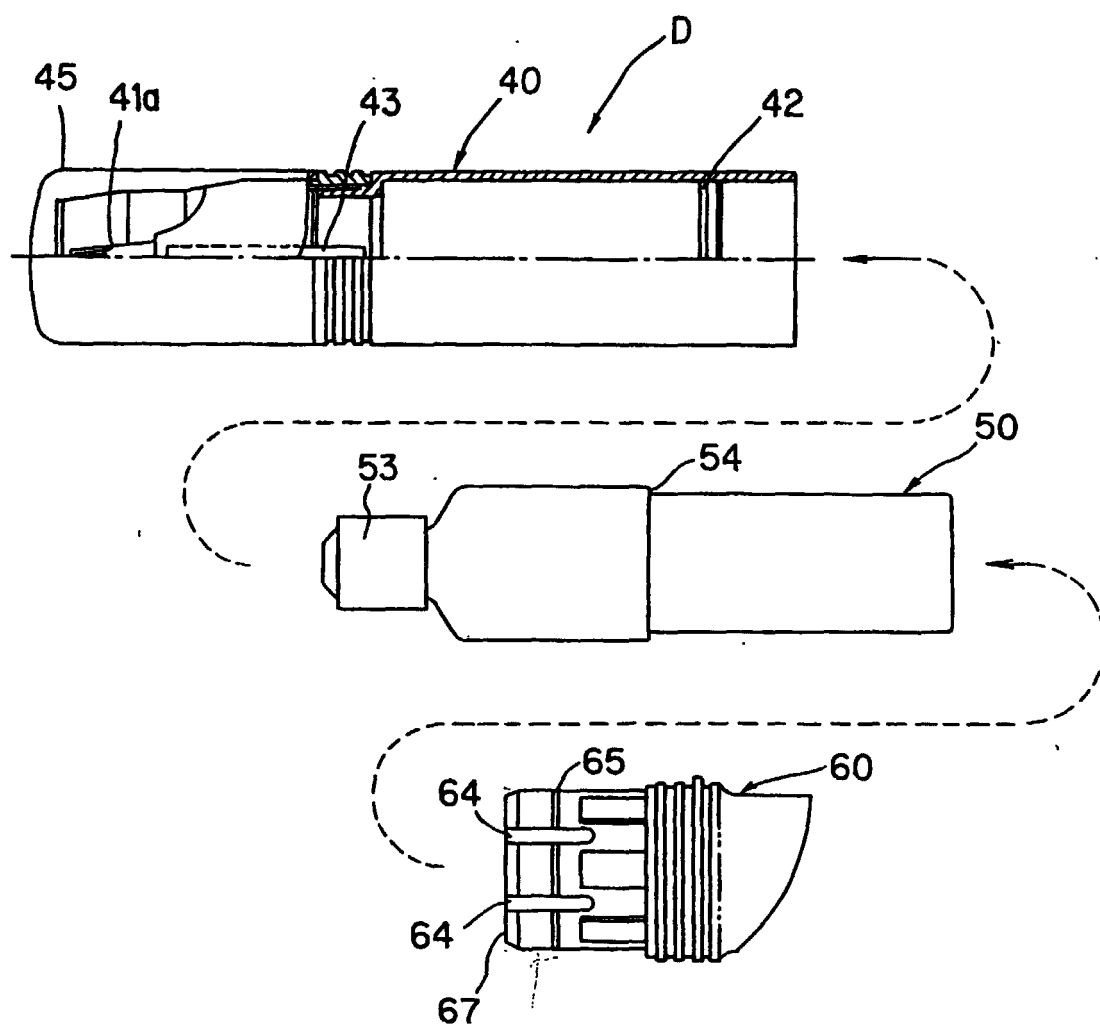
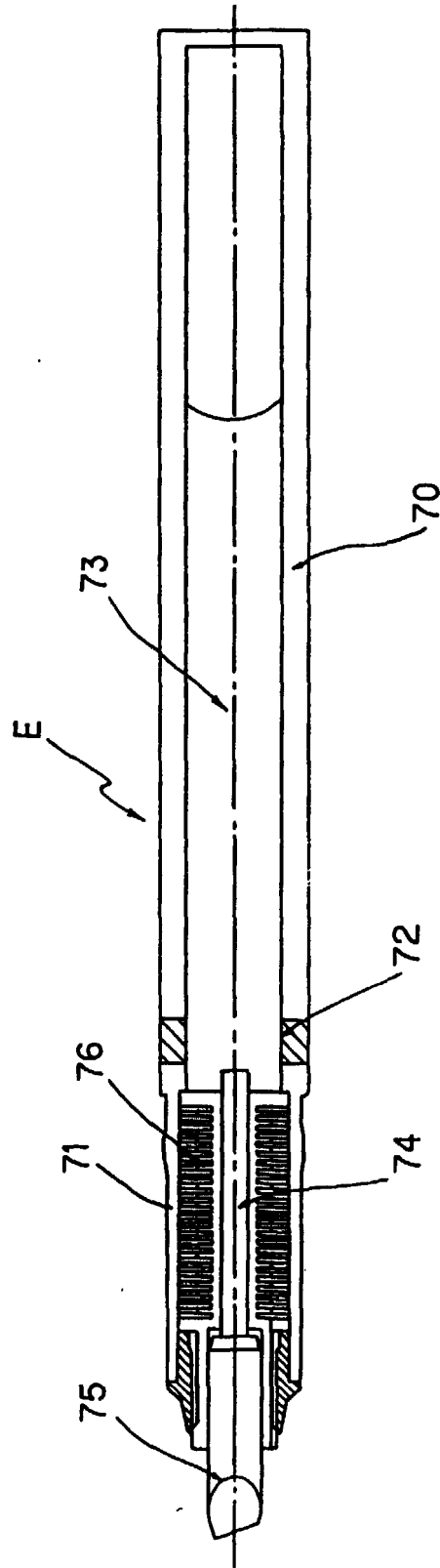


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP99/02804

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl.⁶ B43K8/03, 7/02, 5/02

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)

Int.Cl.⁶ B43K5/00-8/18

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

Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-1999
Kokai Jitsuyo Shinan Koho 1971-1999 Jitsuyo Shinan Toroku Koho 1996-1999

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 57-16119 (Laid-open No. 58-120085) (Mitsubishi Pencil Co., Ltd.), 16 August, 1983 (16. 08. 83), Full text ; Figs. 1, 2	1, 5
A	Full text ; Figs. 1, 2 (Family: none)	2-4, 6, 7
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 59-55665 (Laid-open No. 60-166585) (Maruzen Co., Ltd.), 5 November, 1985 (05. 11. 85), Full text ; Figs. 1, 3 (Family: none)	1-7

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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