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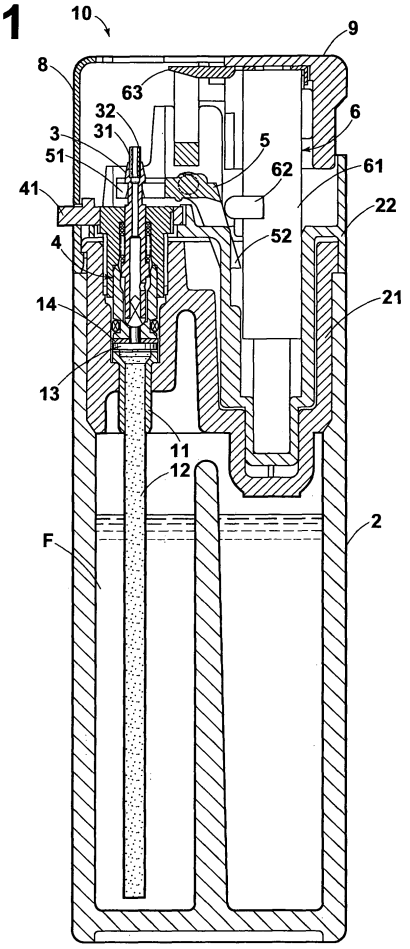
(54) Resin fuel pressure vessel

(57) A resin fuel pressure vessel for containing liquefied gas fuel, which is colored accurately with a predetermined concentration, is provided. The resin fuel pressure vessel is easy to produce, and enables confirmation of the contents therein from the exterior. The resin fuel pressure vessel is constituted by: a tank portion, which is of a sealed structure and constructed of a resin material that enables confirmation of the interior thereof from the exterior; a valve mechanism for opening and closing the passage of the liquefied gas fuel to be ejected; and a wick, which is connected to the valve mechanism and extends within the interior of the tank portion. Pigment is adsorbed on the wick, and the liquefied gas fuel is interchangeably colored, thereby enabling confirmation of the contents of the tank portion from the exterior.

FIG.1



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a resin fuel pressure vessel for an igniter or the like, comprising a tank portion for containing liquefied gas fuel. Particularly, the present invention relates to a container structure for colored liquefied gas fuels.

Description of the Related Art

[0002] There are known fuel injection containers for gas lighters, igniters, gas injection cylinders, and the like, as fuel pressure vessels. In the case that the fuel vessels are metallic and opaque, it is difficult to see the liquefied gas fuel therein. Accordingly, the amount of fuel remaining in a lighter, for example, is not able to be ascertained, and the designs of the fuel vessels are monotonous.

[0003] On the other hand, even if the tank portion of a lighter or the like is made from a transparent resin, the liquefied gas fuel itself is colorless and transparent. Therefore, it is difficult to confirm the remaining amount of fuel from the exterior. To raise the commercial value of lighters, the tank portion itself is colored red, yellow, or green, for example. In order to color the tank portion to be a desired color, it is necessary to color the resin, which is the molding material of the tank portion. However, in the case that colored resin is utilized, problems of color change are generated in the molding machine. That is, the colored resin remains in the molding machine after molding is complete. At a next molding operation, the previous colored resin needs to be flushed until it is completely expelled from the molding machine. Therefore, the initial steps of the next molding operation require time, material fees, and labor, which increases production costs. In addition, because the resin itself is colored, if the color density of the tank portion is desired to be changed, it is difficult to do so, and also difficult to respond to demands for variety in colors.

[0004] In view of the above points, there are known lighters, of which the tank portions are molded from transparent resin material. Liquefied gas contained in the transparent tank portions is colored, so that it is visible from the exterior. As an example of such a gas lighter, there is known that which is disclosed in Japanese Patent Publication No. 64 (1989) -2853. In this gas lighter, the tank for liquefied gas is transparent or semitransparent. Liquefied gas and porous granules, which have pigment adsorbed thereon in advance, are sealed within the gas tank. Thereby, the colored liquefied gas is contained in the transparent or semitransparent gas tank.

[0005] Another such gas lighter is known, as disclosed in Japanese Patent Publication No. 64-2852. In this gas lighter, a tank that contains liquefied gas is transparent or semitransparent. A solution of oil pigment dissolved in an aromatic compound or alcohol is added to liquefied gas at a weight ratio of 15% or less (the amount of pigment added is 0.1 through 1ppm, by weight).

[0006] In pressure vessels that contain colored fuel as described above, the porous granules, on which pigment has been adsorbed, are inserted into the tank portion of the vessel. Then, the tank portion is sealed and the liquefied gas is injected therein, to cause the liquefied gas to contact the porous granules. The pigment adsorbed on the porous granules liquate into the liquefied gas, to add color thereto. Therefore, the steps in the production of the pressure vessels increase, raising production costs.

[0007] When pigment diluted in alcohol is adsorbed onto the porous granules, the porous granules are soaked in the pigment solution, because of their spherical shape. Fluctuations in the amount of pigment adsorbed by the porous granules are generated, thereby causing uniform coloring to be difficult. At the same time, only a small amount of pigment can be adsorbed, and the solution is difficult to handle because the alcohol in the pigment solution does not evaporate easily.

[0008] Particularly, if the pigment concentration is low, the coloring effect is reduced. If the pigment concentration is excessive, a porous filter, through which the fuel passes, may become clogged. In the case of a gas lighter, the flame length thereof may decrease accompanying the use of such fuel. There is also a problem that contaminants (dust, water, etc.) may enter the interior of the tank portion when inserting the pigment adsorbing porous granules therein. Further, the porous granules that move within the tank portion may be falsely recognized as a part of the lighter which has broken off.

[0009] In gas lighters that insert the pigment adsorbing porous granules separately, the size of the granules must be increased in order to increase the concentration of the pigment, that is, to increase the amount of adsorbed pigment. In this case, difficulties are encountered during insertion of the granules into the tank portion, and the capacity of the tank decreases. In addition, time is required for the pigment to permeate the interior of the porous granules and for the pigment solution to dry. Further, it is difficult to obtain uniform adsorption of pigment, that is, fluctuations in the amount of pigment adsorbed by the porous granules are generated, resulting in excessive or insufficient concentrations. In the case that the concentration is excessive, pigment becomes attached to a filter portion, through which combustible fuel passes, causing clogging to occur thereat. If the clogging becomes severe, the amount of fuel that flows through the filter decreases, and a problem is caused in gas lighters that the flame length decreases.

SUMMARY OF THE INVENTION

[0010] The present invention has been developed in view of the foregoing circumstances. It is an object of the present invention to provide a resin fuel pressure vessel

which is easily produced, capable of accurately coloring liquefied gas fuel with a predetermined concentration, and enables confirmation of the contents thereof.

[0011] The resin fuel pressure vessel of the present invention comprises:

a tank portion, which is of a sealed structure and constructed of a resin material that enables confirmation of the interior thereof from the exterior;
a valve mechanism for opening and closing the passage of liquefied gas fuel to be ejected; and
a wick, which is connected to the valve mechanism and extends within the interior of the tank portion; wherein:

pigment is adsorbed on the wick; and
the liquefied gas fuel is interchangeably colored.

[0012] The composition of the liquefied gas fuel may be either one of or a mixture of straight chain saturated hydrocarbons and dimethyl ether.

[0013] Note that here, the "resin material that enables confirmation of the interior thereof from the exterior" is not limited to transparent resin materials. The resin material may be semitransparent or translucent, as long as the contents of the tank portion can be visually discerned from the exterior thereof.

[0014] The resin fuel pressure vessel of the present invention may be applied to gas lighters, igniters, fuel injection containers (injection cylinders) and the like.

[0015] The resin fuel pressure vessel according to the present invention comprises: the tank portion which is constructed of a resin material that enables confirmation of the interior thereof from the exterior; the valve mechanism for opening and closing the passage of liquefied gas fuel to be ejected; the wick having pigment adsorbed thereon; and the liquefied gas fuel, which is interchangeably colored. Therefore, the amount of the colored liquefied gas fuel can be easily confirmed from the exterior. In addition, the attractiveness as a commercial product is improved.

[0016] Wicks are conventionally utilized parts in pressure vessels. Therefore, wicks, on which pigment has been adsorbed, may be mounted within the pressure vessel in the same manner as in a conventional production step. Accordingly, no additional steps are involved during the production of the pressure vessel, and there are no increases in production costs.

[0017] In addition, the wick is of a rod shape and has a large volume. Therefore, during adsorption of pigment, a uniform amount of pigment can be easily adsorbed, thereby suppressing fluctuations in the amount of pigment adsorbed. This enables uniform coloration, as well as adsorption of a great amount of pigment. Also, the great surface area of the wick enables alcohol of the pigment solution to evaporate easily, which improves the handling properties.

[0018] Further, the liquefied gas fuel is enabled to be colored with a variety of colors, simply by exchanging the wick, on which pigment has been adsorbed, with another wick, on which pigment of a different color has been adsorbed. The change of resin materials, such as in the case of molding colored tank portions, and accordingly, the time required for the color changing steps, is obviated. Because there is no resin to be disposed, there is no need to manage waste materials, thereby decreasing production costs.

[0019] Meanwhile, by securing the adsorption of predetermined amounts of pigment, the coloring effect is improved. Also, the concentration does not become excessive, thereby preventing clogging of filters and changes in flame length associated therewith in gas lighters. The problem of contaminants, such as dust and water, entering the tank during the production process is prevented as well. Further, no porous materials float within the tank. Therefore, the attractiveness of the product is improved, in combination with the coloring effect.

[0020] Particularly, wicks are conventionally inserted and provided in tank portions. Accordingly, there is no difficulty in inserting them into the tank portions, nor does their insertion decrease the capacity of the tank portions. Further, obtainment of uniformity associated with increases in the amount of pigment absorbed is facilitated, and the effect of suppressing flame length change in gas lighters becomes conspicuous.

[0021] In addition, the present invention is applicable to dimethyl ether, which is considered a substitute for petroleum gases, as well as petroleum gases, improving the versatility thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Figure 1 is a vertical sectional view of an electric discharge type gas lighter, to which the resin fuel pressure vessel of the present invention is applied.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] Hereinafter, an embodiment of the present invention will be described in detail with reference to the attached drawings. Figure 1 is a vertical sectional view of an electric discharge type gas lighter 10, to which the resin fuel pressure vessel of the present invention has been applied.

[0024] The gas lighter 10 comprises: a tank portion 2, which is constructed of a resin material that enables confirmation of the interior thereof from the exterior and stores liquefied gas fuel F therein; an ejection nozzle 3, which ejects gas from an ejection opening 31 at the tip thereof; a valve mechanism 4, for opening and closing a gas path from the tank portion 2 according to movement of the ejection nozzle 3; a gas lever 5, for pulling the ejection nozzle 3 upward to open the valve mechanism 4 during ignition operations; an electric discharge type ignition mechanism 6, for igniting ejected gas during ignition operations; a cap 8, provided in the peripheral por-

tion above the ejection nozzle 3; and an operation button 9, for actuating ejection of gas and ignition.

[0025] The tank portion 2 is molded into a bottomed cylinder from a multi-purpose synthetic resin, such as AS. Straight chain saturated hydrocarbons, such as propane, isobutane, and n-butane, which are petroleum gases, dimethyl ether, or mixtures of the above are stored in the interior of the tank portion 2 as fuel. An upper lid 21 is fixed to the upper portion of the tank portion 2 so as to hermetically seal the tank portion 2. An intermediate case 22 is mounted on the upper lid 21.

[0026] The valve mechanism 4, which is of a known structure, penetrates the upper lid 21 of the tank portion 2 in the vertical direction. The valve mechanism 4 opens and closes the passage of gas to the ejection nozzle 3 and adjusts the amount of gas ejected. The ejection nozzle 3, in the form of a thin pipe, is provided to be movable in its axial direction at the vertical axial center of the valve mechanism. The tip of the ejection nozzle 3 protrudes from the upper edge of the valve mechanism 4. A nozzle engaging portion 51 of the L-shaped gas lever 5, which is swingably supported, engages the ejection nozzle. A linking portion 52 at the other end of the gas lever 5 extends diagonally downward, and is linked with a lever presser 62, to be described later.

[0027] The valve mechanism 4 opens the gas path to cause gas to be ejected, accompanying vertical movement of the ejection nozzle 3. A porous wick 12, which is formed by sintered polyethylene and extends into the tank portion 2, is mounted to the bottom of the valve mechanism 4 via a wick holder 11. A flow rate adjusting filter 14 is held at the upper portion of the wick holder 11 by a fixing element 13 in the form of a nail. Meanwhile, an annular flame adjusting member 41 is mounted on the upper portion of the valve mechanism 4. The pressed state of the filter 14 is adjusted by rotating the flame adjusting member 41. Thereby, the flow rate of gas that passes from the outer peripheral portion to the inner peripheral portion of the filter 14, the amount of ejected gas, and accordingly, the flame length, are adjusted.

[0028] Note that a nozzle tip 32 is mounted at the ejection opening 31 of the ejection nozzle 3. The nozzle tip 32 disperses a portion of the gas ejected from the ejection opening 31 toward the outer periphery thereof to mix it with air, in order to improve ignition properties by discharge ignition, to be described later.

[0029] Meanwhile, the bottom of the operation button 9 is fitted on the upper edge of a piezoelectric unit 61 of the ignition mechanism 6. The operation button 9 is being capable of being pressed downward. The ignition mechanism 6 comprises the piezoelectric unit 61, which is held by the intermediate case 22. Electrical discharge for ignition is performed by high voltage being applied between an electrical discharge electrode 63 and the ejection nozzle 3 (nozzle tip 32) when the piezoelectric unit 61 is operated.

[0030] In addition, the lever presser 62, which is provided on a movable portion of the piezoelectric unit 61, abuts the linking portion 52 of the gas lever 5 when the operation button 9 is pressed downward. The gas lever 5 is caused to rotate, thereby causing fuel gas to be ejected from the ejection nozzle 3. Further downward movement of the operation button 9 operates the piezoelectric unit 61 to perform ignition discharge.

[0031] Pigment, which is capable of liquating into the liquefied gas fuel F, such as oil pigment, is adsorbed on the wick 12. The liquefied gas fuel F, which is injected into the tank portion 2 contacts the wick 12 and is colored to a predetermined concentration by liquation of the pigment. Thereby, the colored liquefied gas fuel becomes visible from the exterior, enabling easy confirmation of the contents of the tank portion 2.

[0032] An example of pigment adsorption onto the wick 12 will be described. The wick 12 is formed by sintering polyethylene, and is of a porous structure having continuous air bubbles therein. There are cases in which the air bubbles penetrate the wick 12 in a pipe-like fashion, and cases in which the air bubbles are blocked.

[0033] In the pigment adsorption process, first, a pigment solution containing blue, green, or yellow oil pigment dissolved in ethanol is prepared. The wick 12 is soaked in the pigment solution to cause the pigment to be adsorbed thereon. The wick 12, on which the pigment has been adsorbed, is dried naturally, to allow the ethanol to evaporate. Then, the wick 12 is assembled into the transparent resin tank portion 2 of the gas lighter 10. Thereafter, liquefied gas fuel F, such as liquefied petroleum gas and dimethyl ether, is injected into the tank portion 2. The pigment liquates, and the liquefied gas fuel F is colored at a uniform concentration. The concentration of the pigment varies depending on the size of the tank portion 2, but is approximately 100ppm by weight. Note that coloring effects are not significant when the pigment concentration is in the range of 0.1 to 1ppm.

[0034] Ignition durability tests were performed on the gas lighter 10 as described above, to test the lighter performance thereof. In the tests, initial flame length is set to be approximately 30mm, then ignition is repeated by an ignition durability testing machine. After a predetermined number of ignitions, the flame length is measured. Variations in the flame length indicate the clogged state of the filter. Note that variations in maximum flame lengths and minimum flame lengths may also be measured.

[0035] As a result of the tests, there was substantially no change in the flame length in the gas lighter 10 as described above. Problems of clogging did not occur, and it became clear that performance was not hindered when the liquefied gas fuel F was colored with pigment at 100ppm by weight.

[0036] In addition, it is possible to prepare a plurality of wicks 12, each having pigment of a different color adsorbed thereon. The color of the liquefied gas fuel can be varied as desired, by assembling the different wicks 12 into the gas lighter 10.

[0037] Further, the wick is not limited to the sintered

wick described in the above embodiment. The wick may alternatively be formed by fibers, such as polyester and acrylic fiber.

[0038] Note that the embodiment described above comprises an ignition mechanism 6 of the electrical discharge type. However, the present invention may be applied to lighters having ignition mechanisms of the flint type. In the case of the flint type lighter, a gas lever comprises a nozzle engaging portion, for engaging with an ejection nozzle, at one end and an operating portion at the other end. In addition, the present invention may be applied not just to gas lighters, but to any type of igniter.

Claims

1. A resin fuel pressure vessel, comprising:

a tank portion, which is of a sealed structure and constructed of a resin material that enables confirmation of the interior thereof from the exterior;
a valve mechanism for opening and closing the passage of liquefied gas fuel to be ejected; and
a wick, which is connected to the valve mechanism and extends within the interior of the tank portion; wherein:

pigment is adsorbed on the wick; and
the liquefied gas fuel is interchangeably colored.

2. A resin fuel pressure vessel as defined in Claim 1, wherein:

the wick is a sintered wick.

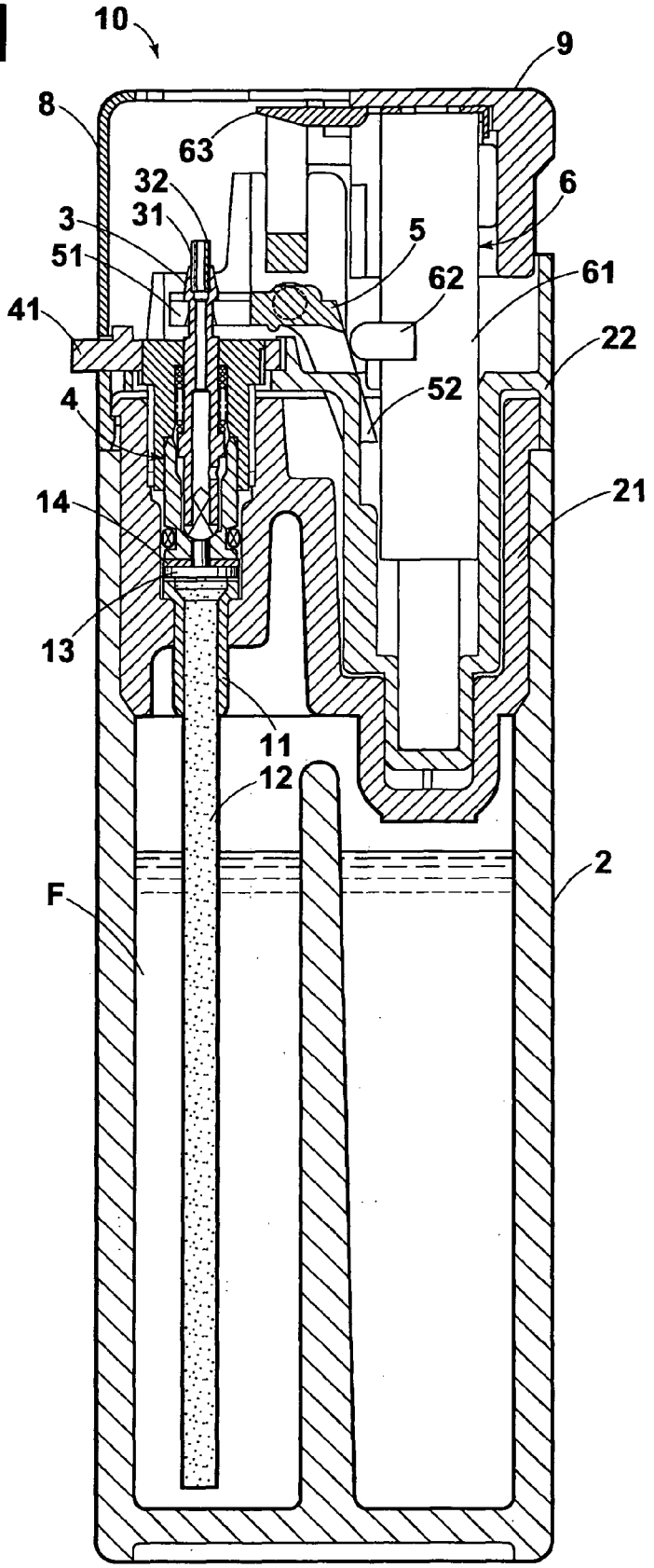
3. A resin fuel pressure vessel as defined in Claim 1, wherein:

the wick is formed by fibers.

4. A resin fuel pressure vessel as defined in Claim 1, wherein:

the composition of the liquefied gas fuel is either one of or a mixture of straight chain saturated hydrocarbons and dimethyl ether.

FIG.1



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EUROPEAN SEARCH REPORT

Application Number
EP 04 03 0792

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.7)
Y	FR 1 444 390 A (RACEK A.) 1 July 1966 (1966-07-01) * page 2, column 2, paragraph 3 * * page 3, column 1, paragraph 3 * * figures 1,3 *	1,3,4	F23Q2/16 F23Q2/44
Y	GB 593 146 A (ALFRED GERMAN ROSE; ROSE BROTHERS LIMITED) 9 October 1947 (1947-10-09) * page 2, line 5 - line 91 * * figure 1 *	1,3,4	
A	FR 1 461 284 A (ROSFELDER A.) 15 February 1967 (1967-02-15) * page 3, column 1, paragraph 5 - column 2, paragraph 1 * * figure 1 *	1-4	
A	PATENT ABSTRACTS OF JAPAN vol. 007, no. 031 (M-192), 8 February 1983 (1983-02-08) & JP 57 184830 A (FUKUO IWABORI), 13 November 1982 (1982-11-13) * abstract *	1-4	TECHNICAL FIELDS SEARCHED (Int.Cl.7) F23Q
A	US 5 447 430 A (KIM ET AL) 5 September 1995 (1995-09-05) * column 3, line 10 - line 13 *	1-4	
A	FR 2 692 906 A (BALLAND BENOIT; WITZIG PATRICK; CHAN YOU PAUL) 31 December 1993 (1993-12-31) * page 1, line 1 - line 25 *	4	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 September 2005	Coquau, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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E : earlier patent document, but published on, or after the filing date
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L : document cited for other reasons

& : member of the same patent family, corresponding document

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 03 0792

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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14-09-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 1444390 A	01-07-1966	NONE	
GB 593146 A	09-10-1947	NONE	
FR 1461284 A	15-02-1967	NONE	
JP 57184830 A	13-11-1982	JP 1002852 B	18-01-1989
		JP 1519331 C	29-09-1989
US 5447430 A	05-09-1995	NONE	
FR 2692906 A	31-12-1993	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82