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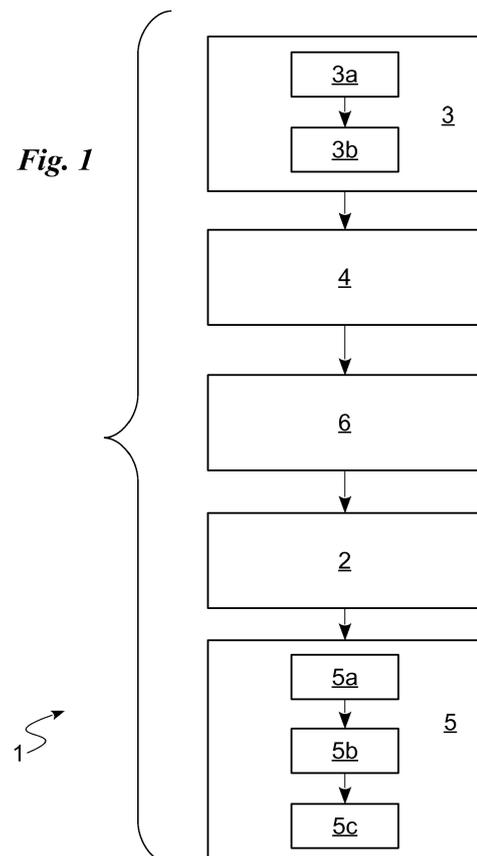
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(54) **PROCESS FOR PRODUCING A HYDROCARBON MIXTURE**

(57) A process (1) for producing a first mixture (20) defined by at least two components (21), and at least one additional hydrocarbon component (23), at least one of the components (21) being a solid hydrocarbon component (22), comprising: a fragmentation step (4) of the solid hydrocarbon component (22), a homogenisation step (2) of the two components (21) defining said first mixture (20), a stabilisation step (5) of the hydrocarbon mixture (20), the stabilisation step (5) comprising, in the following order, at least: a breaking step (5a) of the components (21) and the additional hydrocarbon component (23) of the hydrocarbon mixture (20), an ionisation step (5a) of the components (21) and of the additional hydrocarbon component (23) of the first mixture (20), a dispersion step (5a) of the fragmented hydrocarbon component (22) and the additional hydrocarbon component (23) of the hydrocarbon mixture (20).

Fig. 1



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Description

[0001] The present invention relates to a process for producing a hydrocarbon mixture of the type as recited in the preamble of Claim 1.

[0002] In particular, the invention relates to a process for producing a hydrocarbon compound essentially for industrial use.

[0003] In industrial applications, widespread use has been made over the years of compounds comprising hydrogen, carbon and oxygen mainly as a base in refineries, in fuels or lubricants.

[0004] In particular, mixtures composed of oil and water are widely used owing to the fact that oil contains hydrogen and carbon, while water contains hydrogen and oxygen.

[0005] In the current state of the art, the aforesaid mixtures are mostly heterogeneous compounds, as the hydrophobic properties of oil foster the formation of heterogeneous mixtures, mainly owing to the different polarities of the ingredients involved, in which the oil is not mixable and therefore will not dissolve in the water.

[0006] Such conformations thus prevent stable molecular bonding between the components and so lead to substantial overall instability.

[0007] Nonetheless, a number of technical solutions have been adopted to reduce the undesirable effects mentioned above.

[0008] For example, patent application RU-A-2021329 describes a low-viscosity oil-in-water emulsion characterised by a production process designed to stabilise the bonding between molecules.

[0009] In that sense, it envisages a process for mixing viscous hydrocarbons and water mediated by emulsifying agents at high temperatures and with the incremental addition of water to the compound.

[0010] Patent application US-A-4394131 defines instead a mixing process implemented by means of a high-speed or high-energy rotary impact mill. This mill is used to obtain an emulsion or, rather, a colloidal suspension.

[0011] The colloidal suspension is a compound in which the dispersed phase is very fine, in the order of μm , and in which, as a consequence, although the suspension is microscopically inhomogeneous, it is stable.

[0012] Patent application US-A-4392865 describes stable emulsions prepared using surfactants or more precisely surface active agents that react with solid macromolecular substances.

[0013] Surfactants are substances that lower the surface tension of the liquid (continuous phase) in which they are placed and so facilitate its mixability with substances that form the dispersed phase. Made up of a hydrophilic head and a hydrophobic tail, they bind to dispersed particles and prevent the latter from aggregating to form larger particles owing to the repulsive forces between heads having the same polarity.

[0014] In other words the surfactants make it possible to maintain the stability of the suspension in which they

react.

[0015] The prior art solutions described above have several significant drawbacks.

[0016] In particular, none of the compounds or the methods of production thereof achieve a sufficient degree of stability owing to the stratification or, more precisely, the aggregation of the dispersed substances.

[0017] Moreover, the use of surfactants significantly increases processing costs while generally not guaranteeing an adequate stability of the emulsions in question.

[0018] Besides, with oil-in-water emulsions, in which water is the continuous phase, the corrosive effect on production machinery is accentuated.

[0019] For compounds made up of solid macromolecular substances problems also arise in connection with wear due to friction of equipment moving parts and clogging of exhaust filters during processing.

[0020] In this situation the technical purpose of the present invention is to develop a process for producing a hydrocarbon mixture that substantially overcomes the inconveniences mentioned above.

[0021] Within the sphere of said technical purpose one important aim of the invention is to obtain a hydrocarbon mixture capable of guaranteeing high and lasting efficiency and that is thus versatile for use in different industrial activities.

[0022] Therefore another important aim of the invention is to implement a production process for producing a hydrocarbon mixture with high stability.

[0023] A further purpose of the invention is to incorporate the conventional methods in order to achieve the aforesaid aims so as to simplify the process according to the invention..

[0024] A final, but no less important aim of the invention is to obtain a process that is more economical than those known in the prior art, for example by eliminating the use of expensive additives such as surfactants in the processing phase.

[0025] The technical purpose and specified aims are achieved with the process for producing a hydrocarbon mixture as claimed in the appended Claim 1. Examples of a preferred embodiment are described in the dependent claims.

[0026] The characteristics and advantages of the invention are clearly evident from the following detailed description of preferred embodiments thereof, with reference to the accompanying drawings, in which:

Fig. 1 is a functional diagram of the process for producing a hydrocarbon mixture;

Fig. 2 is a perspective view of the cavitation chamber;

Fig. 3 is a cross-section of a single transducer device; and

Fig. 4 shows a pie chart with an approximate description of the components of the hydrocarbon mixture described.

[0027] In this document, measurements, values, forms and geometric data (such as perpendicularity and parallelism), when used with terms such as "about" or other similar terms such as "practically" or "substantially", are to be considered without any measurement errors or inaccuracies due to production and/or manufacturing errors and, above all, without any slight divergence from the value, measurement, form or geometric data with which they are associated. For example, such terms, when associated with a value, preferably indicate a difference of not more than 10% of said value.

[0028] Moreover, terms such as "first", "second", "upper", "lower", "main" and "secondary" do not necessarily indicate an order, priority or respective position, but may simply be used in order to make a clear distinction between the different components.

[0029] With reference to the figures, reference numeral 1 globally denotes the process for producing a hydrocarbon mixture according to the invention.

[0030] The process 1 for producing a first mixture 20 comprises preferably a selection step 3, a fragmentation step 4, an additive mixing step 6, a homogenisation step 2 and a stabilisation step 5.

[0031] The hydrocarbon mixture 20 is for example a water suspension containing hydrocarbons possibly finely dispersed therein.

[0032] The selection step 3 comprises for example a calculation step 3a in which the atomic weights, or the masses, of the selected components 21 forming the first mixture 20 are preferably calculated.

[0033] The components 21 preferably comprise water and hydrocarbon components 22.

[0034] Said hydrocarbon components may be of any type, for example carbon or crude oil or peat or algae or even oily sludge and may therefore be solids or liquids.

[0035] The hydrocarbon components 22 are preferably solids and in particular consist of carbon.

[0036] The selection step 3 further preferably comprises a balancing step 3b performed after said calculation step 3a in which the quantity of components 21 in the hydrocarbon mixture 20 is balanced according to the principles of chemical equilibrium.

[0037] The quantities of other components to be added in later steps of the process 1 are also preferably calculated and balanced in this step. Said components are at least one additional hydrocarbon component 23: for example oil or more generally a liquid hydrocarbon substance the function of which is to fluidify and thus regulate the viscosity of the hydrocarbon mixture 20.

[0038] The selection step 3 is preferably followed by the fragmentation step 4.

[0039] This step preferably specifically consists in splitting the particles of the hydrocarbon component 22, for example a solid, into smaller fragments. Said fragments may be of any shape and size and are for example smaller than 100 μm and appropriately approximately 50 μm .

[0040] Said fine division thus makes it possible for example to combine the hydrocarbon component 22 with

another component 21 preferably, as mentioned previously, water in order to form the hydrocarbon mixture 20.

[0041] In this way, thanks to the properties of the finely fragmented or pulverised hydrocarbon components 22, the hydrocarbon mixture 20 is for example in the form of a suspension in which the hydrocarbon component 22 is dispersed, and not precipitated, in the water solution.

[0042] The fragmentation step 4 may be performed in an atomiser: specifically, the dissolved micrometric particles are pushed by a blower into a convergent duct which increases their speed.

[0043] The atomiser is for instance of the type known in the prior art.

[0044] However, the fragmentation step 4 preferably takes place inside a grinder.

[0045] The grinder, thanks to a mechanism for example of the type with a rotary cutting blade, crumbles and disintegrates the bonds between the molecules in the hydrocarbon component 22.

[0046] As already mentioned, after the fragmentation step, the hydrocarbon mixture 20 preferably consists of a water suspension containing fragments of dispersed hydrocarbon component 22.

[0047] Next the process 1 preferably envisages an additive mixing step.

[0048] The additional hydrocarbon component 23 mentioned above is preferably added to the suspension forming the hydrocarbon mixture 20 to regulate its viscosity. In particular, as already mentioned, the quantities of additional hydrocarbon component 23 are preferably pre-dosed during the selection step 3.

[0049] The additive mixing step 6 is preferably followed by the homogenisation step 2.

[0050] During this step the hydrocarbon mixture 20 is mixed in order to alter its viscosity. The homogenisation step 2 may be performed in different ways.

[0051] For example it may be performed using a blender, of the type known in the prior art, with rotary blades that mix the components 21 and the additional hydrocarbon components 23 to improve the blending and the density of the hydrocarbon mixture 20 and thus its viscosity.

[0052] Alternatively, homogenisation may be obtained by mixing water and the hydrocarbon substance delivered through counterposed spray nozzles inside an excitation chamber in order to mix the components 21 and/or the additional hydrocarbon components 23 in the best possible way.

[0053] Said method also ensures an active and ionised hydrocarbon mixture 20.

[0054] Another method that may be used consists of placing the components 21 and/or the additional hydrocarbon components 23 inside containers that vibrate at high frequency in order to facilitate homogenisation through the motion of the excited molecular particles.

[0055] Homogenisation may also be performed for example using jets of pressurised air or gas. The water or component 21 may be reduced to small droplets (micro or nano-metric) and surrounded and thus emulsified by

hydrocarbon particles, forming the hydrocarbon components 22 and/or additional hydrocarbon components 23, which are in the gaseous state and also miniaturised to the scale of micro or nano-metric dimensions.

[0056] In this example the hydrocarbon oil constitutes the continuous phase and the water droplets represent the dispersed phase.

[0057] Another example of homogenisation is obtained by introducing heat into the hydrocarbon mixture 20 in order to enhance the mixability of the components 21 and of the additional hydrocarbon components 23 involved in the process 1.

[0058] The substances involved thus go through cycles of evaporation and condensation which foster adhesion for example between the water particles and the hydrocarbon particles so that they are distributed and mixed homogeneously.

[0059] Alternatively to the methods described above, homogenisation may be performed by applying pressure. High pressure ratios induce a state of molecular agitation and thus substantially increase the temperature of the hydrocarbon mixture 20, reducing its viscosity and thus improving the mixability of the components 21 and of the additional components 23.

[0060] The homogenisation step 2 may also be performed using rotor-stator type mixers.

[0061] One or more rotor-stator assemblies may be arranged coaxially in series to guarantee different mixing stages of the components 21 and of the additional components 23.

[0062] The homogenisation step 2 may thus envisage the use of different methods and devices.

[0063] However, said step 2 is preferably performed using an ultrasound mixer.

[0064] For example the ultrasound mixer may envisage the forced introduction of components 21 and additional components 23 at high pressure and high speed through orifices, so that they are pushed towards the edges of lamellar-shaped obstacles. The fluid in the hydrocarbon mixture 20 thus forms vortices perpendicular to the flow characterised by a stationary diffusion within sonic frequencies. The force generated on the mixture 20 by the sonic oscillations thus causes cavitation of the substances within the ultrasound frequency range.

[0065] The homogenisation step 2 is preferably performed using a cavitation mixer 100 as will now be described.

[0066] The cavitation mixer 100 is for example a vessel of any shape and size in which at least one wall is arranged so as to come into contact with vibrating transducer assemblies 101 or in which said vibrating assemblies are placed so as to come into contact with the contents, i.e. preferably the components 21 and/or the additional components 23.

[0067] A transducer assembly 101 is a component connected to a generator 200, suitable to generate, or more simply to emit alternating electrical current and one or more transducers 101, connected electrically by means

of specific electrical connections 102.

[0068] Said generator comprises control means suitable to control the electrical frequency and to activate, deactivate and in general control the transducer assembly 101.

[0069] The transducer assembly 101 thus converts the alternating electrical signal coming from the electrical connections 102 into mechanical vibrations with the same frequency.

[0070] It has resonance frequencies and, if activated at the same frequencies, causes particularly large mechanical vibrations which permit the phenomenon of cavitation.

[0071] In particular, the transducer assembly 101 is formed so as to obtain resonance frequencies at frequency intervals of between 25 kHz and 50 kHz, more in particular at intervals of around 36 kHz - 42 kHz. When cavitation occurs in these vibration intervals the positive effects of the mixing of the components 21 and of the additional components 23 are maximised.

[0072] The transducer assembly 101 further comprises a plurality of piezoelectric units 103.

[0073] Said piezoelectric units 103 are made of piezoelectric ceramic material preferably consisting of an intermetallic lead and titanium ceramic commonly known as lead-titanate.

[0074] They are preferably disc-shaped and are also preferably stacked and electrically connected to the electrical connections 102.

[0075] The electrical connections 102 comprise conducting elements 104 and electrical cables 105, connected to one another.

[0076] In particular, the former are suitable to power the piezoelectric units 103 and the latter connect the conducting elements 104 to the generator.

[0077] The conducting elements 104 are appropriately disc-shaped and made of an alloy of copper or other conductive metal and arranged between the stacked piezoelectric units 103. Furthermore they preferably have a diameter that is equal or similar to the diameter of the piezoelectric units 103 and a height of lower than 4 mm.

[0078] The transducer assembly 101 preferably further comprises a block body 106, which is also disc-shaped, and a diffuser 107 both made of metal material, preferably steel.

[0079] The block body 106 and the diffuser 107 are preferably stacked at both ends of the piezoelectric units 103 and of the conducting elements 104, and enclose the latter by means of specific fixing means 108 appropriately consisting of an Allen screw engaging with the diffuser 107.

[0080] To permit the fixing of the block body 106, the piezoelectric units 103, the conducting elements 104 and the diffuser 107, said components have a central through hole through which the fixing means 108 pass.

[0081] In particular the fixing means 108 engage with the block body 106, appropriately by means of the head of the screw, having dimensions greater than the dimen-

sions of the hole formed in the block body 106, and with the diffuser 107 which is provided with a blind threaded hole. The fixing means 108 thus sandwich the various components that make up the transducer 101.

[0082] The purpose of the block body 106 and the fixing means 108 is to allow the correct channelling of the mechanical vibrations towards the diffuser 107, the purpose of which is to diffuse the mechanical vibrations produced by the piezoelectric units 103.

[0083] In particular the block body 106 is cylindrical in shape and has a diameter that is similar to or the same as the diameter of the piezoelectric units 103.

[0084] As already mentioned, the transducer assemblies 101 are preferably arranged so as to come into contact with at least one wall of the cavitation chamber 100.

[0085] Furthermore, the methods used to perform the homogenisation step 2 may comprise any one of the methods cited in the examples provided above or may alternatively include combinations of these methods.

[0086] For example the cavitation chamber 100 may be subjected to ultrasound oscillations and to the application of pressure in order to further enhance the mixability of the components 21 and of the additional hydrocarbon components 23.

[0087] It is also possible, for example, to combine the pressurised cavitation chamber 100 with an external heat exchanger capable of increasing the agitation of the molecules in the substances contained in the chamber 100.

[0088] Alternatively, again by way of example, hydrocarbon mixtures may be homogenised exclusively by simultaneously applying heat and pressure

[0089] Otherwise, methods that involve mechanical mixing using rotary components can be combined with methods that use jets of gas or air to facilitate and further enhance the homogenising effects of the separate processes.

[0090] Various other combinations of two or more of the methods described are also possible, even though these are not mentioned here in order to avoid repetition.

[0091] At the end of the homogenisation step 2 the hydrocarbon mixture 20 that is obtained is not immediately available for use, but preferably undergoes a further stabilisation step 5 for example inside a breakdown chamber.

[0092] The hydrocarbon mixture 20 might in fact not be entirely stable following the homogenisation step 2. In particular, with the passing of time the components 21 and the additional components 23 tend to aggregate.

[0093] This situation occurs when the mixture 20 tends to lose the characteristics typical of a suspension and when the finely dispersed hydrocarbons tend to form clumps and stratify thus undermining the homogeneity and functionality of the hydrocarbon mixture 20.

[0094] This inconvenience can be overcome, as already mentioned in the discussion of the prior art, by using surfactants or surface active agents which lower the surface tension of the liquid and facilitate mixing.

[0095] In particular the surfactants group up with frag-

ments of hydrocarbon components 22 and/or additional hydrocarbon components 23 to form so-called micelles characterised by a sort of single-polarity coating that thus repel other micelles.

[0096] This repulsion helps to maintain the separation of the hydrocarbon fragments and thus of the suspension.

[0097] However said surfactants increase the friction of the mixture 20, and also increase the likelihood of clogging any filters in the machinery in which the hydrocarbon mixture 20 is used. They also give rise to the corrosive side effects of the mixture 20 on the equipment involved in the process.

[0098] Therefore the stabilisation step 5 preferably excludes the use of surfactants and envisages the implementation of different methods.

[0099] In particular the stabilisation step 5 preferably comprises a breaking step 5a, an ionisation step **5b** and a dispersion step **5c**.

[0100] The breaking step consists for example in the molecular dissociation of the components 21 and of the additional hydrocarbon components 23. The molecules of the components 21 and of the additional components 23 may be introduced into a machine, for example as described in patent application WO-A-2013075832 (specifically from pages 7 to 10), suitable to split the bonds between the molecules in the hydrocarbon mixture 20.

[0101] Said machine may for example consist in an electric field generator suitable to electronically interact with the atoms in the mixture 20, by activating the binding electrons, in order to facilitate their separation from the binding atoms and thus foster a substantial reduction in the dimensions of the molecules involved in the process 1.

[0102] The breaking step 5a is preferably followed by the ionisation step 5b of the components 21 and additional components 23.

[0103] In this step, for example, all the hydrocarbon components may be polarised (i.e., with the same polarity) and the additional components 23 dissociated, and thus miniaturised, in order to foster their association with hydrogen ions from water molecules, preferably one of the components 21, which are also polarised.

[0104] Thus, the selective ionisation of the molecules of the hydrocarbon mixture 20 is preferably followed by the dispersion step 5c in which for example the dissociated hydrocarbon molecules of the mixture 20 are able to bind stably with the ions produced, for example the hydrogen ions, in order to form stable and single-polarity bonds between them and thus foster the dispersion of the hydrocarbons in the suspension.

[0105] The hydrocarbon mixture thus obtained is stable and the hydrocarbons it contains do not tend to aggregate and undermine the homogeneity of the compound owing to the repulsive force of the single-polarity of the hydrocarbons finely dispersed in the water solution.

[0106] However, the stabilisation step 5 described may be performed by exploiting the principles of cavitation

described primarily in patent application US-7934474 (in particular in paragraphs 10 and 11).

[0107] For example the particles of the components 21 and of the additional components 23 may actually flow under pressure through the orifices connected to an anvil encased spring so as not to interrupt the fluid flow, or specifically shaped rotors-stators may be used to facilitate cavitation of the fluid passing over them.

[0108] Generally speaking, cavitation is a phenomenon that occurs where the local pressure suddenly falls so that the liquid is able to expand, as the limits imposed by the surface tension are exceeded, and forms vapour pockets destined to implode in higher pressure zones.

[0109] The implosion of the particles facilitates the reduction in size of the molecules in the hydrocarbon mixture 20 so that the materials can be kept well dispersed within the suspension.

[0110] The process 1 for producing a hydrocarbon mixture according to the invention achieves some important advantages.

[0111] As stated above, the hydrocarbon mixture 20 is highly stable and the mixture that is obtained has excellent durability.

[0112] In addition to these advantages, the process is highly economical.

[0113] It does not involve the use of surfactants, which are one cause of the rise in costs in the production of stable hydrocarbon substances such as fuel.

[0114] The low decay or degradation of the hydrocarbon mixture 20 together with its stability and inexpensiveness make the production process 1 competitive in the production, for example, of fuel for electric and thermal power generation.

[0115] The balancing technique used in the selection step 3 and which forms the basis of the production process 1 means the mixture 20 has a very well balanced volatility, which is advantageous.

[0116] The mixture 20 produced is thus about 20% more energy efficient than comparable substances produced using conventional methods and has fewer drawbacks in terms of environmentally harmful emissions.

[0117] The absence of surfactants reduces the friction of the mixture 20 to such an extent that it can advantageously be used as a lubricant, for example in industrial pumps.

[0118] In conclusion the hydrocarbon mixture 20 produced using the process 1 has a high evaporation coefficient (98%) and is therefore suitable for use, for example, in refineries for the production of standard engine fuel.

[0119] Modifications and variations may be made to the invention described herein without departing from the scope of the inventive concept as defined in the claims.

[0120] For example, as already mentioned, it is possible to combine different procedural techniques in the various steps. The homogenisation step 2 and the stabilisation step 5 may in fact envisage the use of different techniques, or combinations of these.

[0121] All details may be replaced with equivalent elements and the scope of the invention includes all other materials, shapes and dimensions.

Claims

1. Process (1) for producing a first mixture (20) defined by at least two components (21), and at least one additional hydrocarbon component (23),

- at least one of said components (21) being a solid hydrocarbon component (22),
- and **characterised by** comprising:
 - a fragmentation step (4) of said at least one solid hydrocarbon component (22),
 - a homogenisation step (2) of said at least two components (21) defining said first mixture (20),
 - a stabilisation step (5) of said hydrocarbon mixture (20),

said stabilisation step (5) comprising, in the following order, at least:

- a breaking step (5a) of said components (21) and said additional hydrocarbon component (23) of said hydrocarbon mixture (20),
- an ionisation step (5a) of said components (21) and of said additional hydrocarbon component (23) of said first mixture (20),
- a dispersion step (5a) of said fragmented hydrocarbon component (22) and said additional hydrocarbon component (23) of said hydrocarbon mixture (20).

2. Process (1) as claimed in the preceding claim, wherein said homogenisation step (2) is implemented inside a cavitation chamber (100), said cavitation chamber (100) permitting the mixing of said components (21) and said additional hydrocarbon component (23) by means of cavitation induced by ultrasound pulses.

3. Process (1) as claimed in claim 1, including a selection step (3) comprises:

- a calculation step (3a) of the atomic weights of said components (21) and said additional hydrocarbon component (23), and
- a balancing step (3b) of the quantities of said components (21) and said additional hydrocarbon component (23) according to the principles of chemical equilibrium.

4. Process (1) as claimed in one or more of the preceding claims, wherein said fragmentation step (4) is suitable to reduce said hydrocarbon component (22) into fragments with dimensions at least smaller than

100 μm .

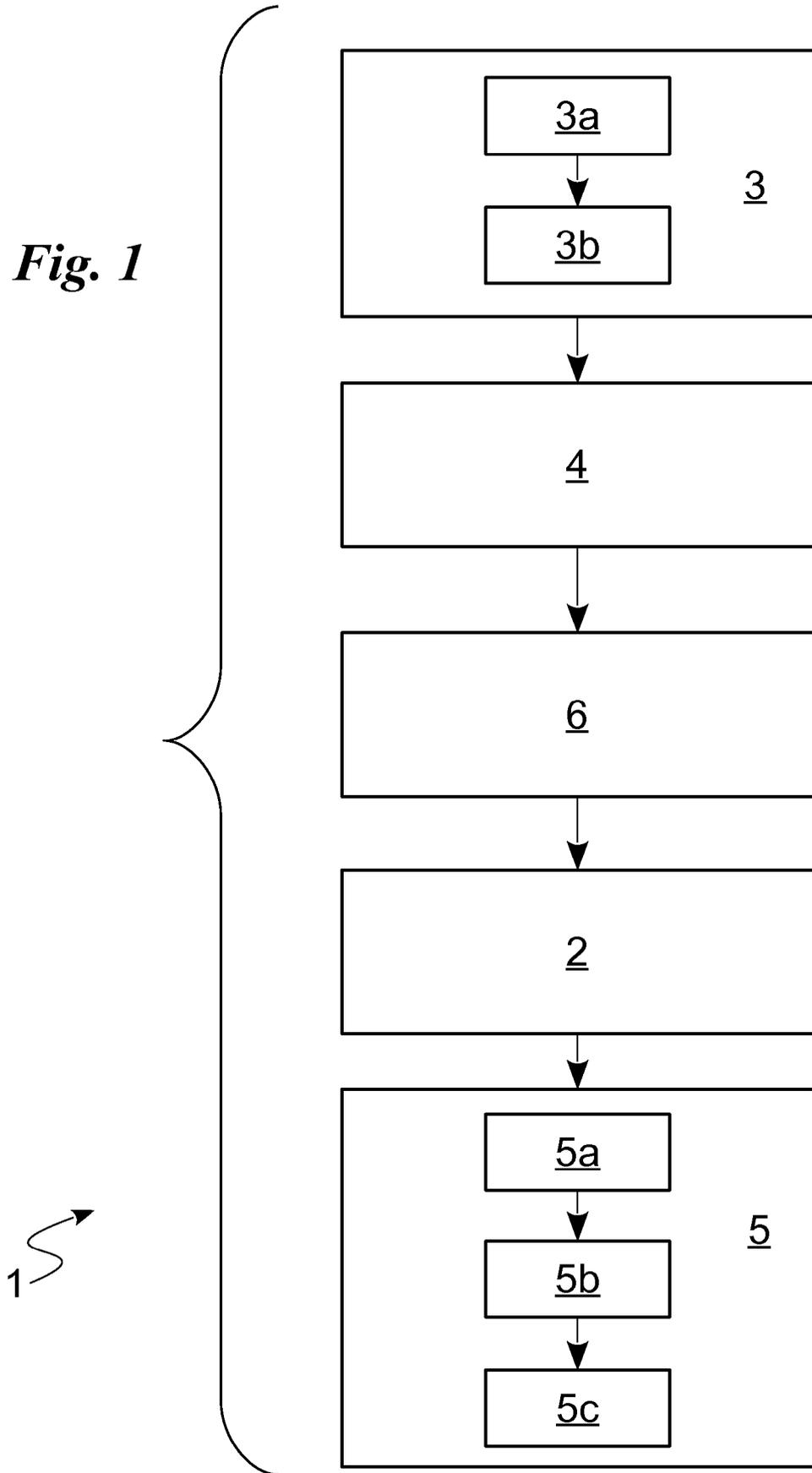
5. Process (1) as claimed in one or more of the preceding claims, wherein one of said components (21) consists of water and said hydrocarbon component (22) is any one of carbon, peat, algae and organic hydrocarbons. 5
6. Process (1) as claimed in one or more of the preceding claims, comprising an additive mixing step (6) of at least one additional hydrocarbon component (23), said additional hydrocarbon component (23) being comprised in said hydrocarbon mixture (20) and pre-dosed on the basis of the calculations done during the selection step (3); said additive mixing step (6) being performed between said homogenisation step (2) and said stabilisation step (5). 10
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7. Process (1) as claimed in one or more of the preceding claims, wherein said homogenisation step (2) is suitable to regulate the viscosity of said hydrocarbon mixture (20), by means of mixing. 20
8. Process (1) as claimed in one or more of the preceding claims, wherein said breaking step (5a) consists in the molecular dissociation of said components (21) and said additional hydrocarbon components (23). 25
9. Process (1) as claimed in one or more of the preceding claims, wherein said ionisation step (5a) consists in the formation of single-pole hydrocarbon molecules starting from said hydrocarbon components (22) and said additional hydrocarbon components (23). 30
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10. Process (1) as claimed in one or more of the preceding claims, wherein said dispersion step (5a) consists in the formation of electrically stable molecules comprising at least one of said components (22) bound to one of said hydrocarbon component (22) and said additional hydrocarbon component (23). 40

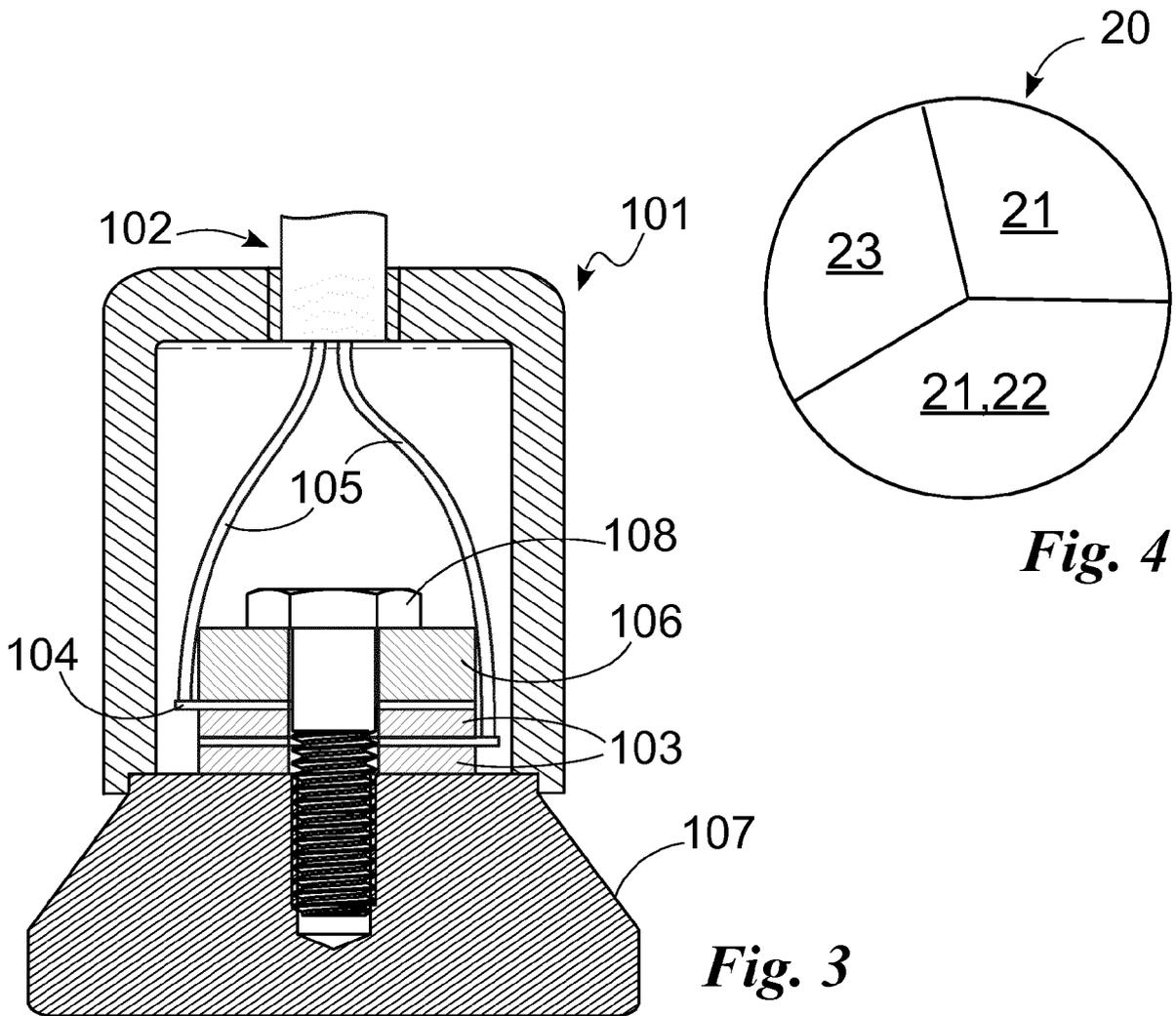
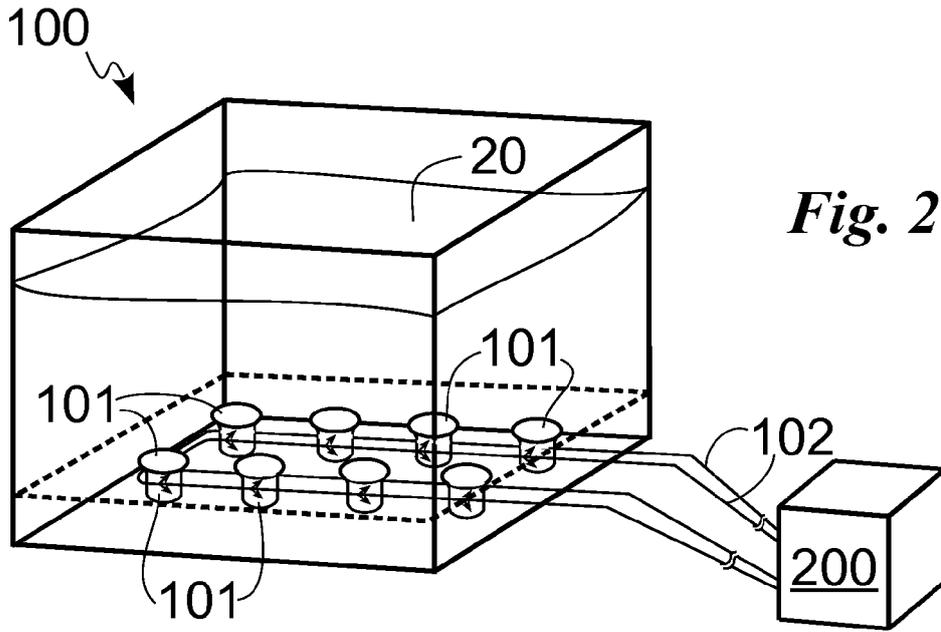
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Fig. 1







EUROPEAN SEARCH REPORT

Application Number
EP 17 17 7341

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	<p>OREN M J ET AL: "Peat-water-oil mixture as a low cost liquid fuel", FUEL, IPC SCIENCE AND TECHNOLOGY PRESS, GUILDFORD, GB, vol. 69, no. 10, 1 October 1990 (1990-10-01), pages 1326-1327, XP025456961, ISSN: 0016-2361, DOI: 10.1016/0016-2361(90)90297-4 [retrieved on 1990-10-01] * page 1 *</p> <p style="text-align: center;">-----</p>	1-10	<p>INV. C10L1/32 B01F3/08</p>
X	<p>JP S57 170995 A (TANAKA MASARU) 21 October 1982 (1982-10-21) * abstract *</p> <p style="text-align: center;">-----</p>	1-10	<p>TECHNICAL FIELDS SEARCHED (IPC)</p> <p>C10L B01F</p>
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 July 2017	Examiner Gzil, Piotr
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p>		<p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 17 17 7341

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JP S57170995	A	21-10-1982	NONE

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

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