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(54) Fuels having a low impact on the environment

(57) Fuels having low impact on the environment are obtained from carefully dosed mixtures of sweet oil, fossil fuel oil with low sulphur content, refined and/or not refined vegetable oleins, refined and/or unrefined vegetable oil, alkyl esters and petroleum spirits so as to obtain a pure vegetable gas oil, semi-vegetable gas oil and semi-vegetable fuel oil .

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Description

Recent developments of environmental protections topics and the need to obtain fuels with a minimized impact on the environmental have led to the formulation of fuels apt to meet technical combustion requirements as well as the imposed emission quality levels at the stack.

On this subject, attention is especially riveted on sulphurized compounds that endanger plants and animal life (acid rains), on unburnt products (flue gases) on carbon monoxide (blood poisoning) and on the production of carbon dioxide (greenhouse effect).

Definite limits for noxious emissions are now enforced by Law (the Italian Presidential Degree 203/88 and the Law n° 349 enacted in 1986) and the utilization of fuels is subject to special authorizations. However besides the use of fossil fuels, studies are also under way on the utilization of other, not yet exactly typified fuels derived, for example, from vegetable oils.

This invention has the aim to suggest a series of new fuels, the basic constituents of which are properly proportioned and mixed; their composition and use feature innovative characteristics especially with regard to residual combustion products that have a very low impact on the environment.

As technological background regarding the present invention there are to mention same documents as it follows.

In the GB-A-2 099 449 it is disclosed a synthetic liquid fuel and fuel mixtures comprising fatty acid esters in which the alkyl presents from 1 to 12 carbon atoms. The invention WO-A-9 220 761 treats a fuel mixture containing at least one vegetable and/or animal oil at least one aliphatic alchool with 1-5 C-atoms and petrol.

The document FR-A-2 492 402 concerns a mixture of 0-90% in volume of at least a gas oil and 100-10% in volume of at least a fatty acid ester.

Besides it is known GB-A-2 127 433 which treats of a fuel composition comprising 10-40% by volume of coconoot oil, 10-40% by volume of palm kernel oil and 20-80% by volume of kerosene. According to DE-A-2 930 220 it is provided a mixture of 25-75% in volume of beet oil and 75-25% in volume of diesel oil. The document DE-A-4 135 294 provides a mixture of at least a vegetal and/or animal oil and at least an aliphatic grease.

Finally according to JP-A-58 198 590 the molasses are converted into fuel by adding a combustile material.

According to this invention, the basic constituents are:

a) sweet oil (distillate fractions having a boiling point in the 180°-300°C range);
b) fuel oil with a low sulphur content (a complex hydrocarbon mixture with less than 85% in volume volatile matter and less than 1% in weight sulphur content);
c) refined and/or unrefined vegetable olein (a mixture of liquid triglycerides derived frown the extraction of vegetable fats);
d) refined and/or unrefined vegetable oils derived from various oleiferous crops;
e) Vegetable oil based alkyl esters (a mixture of fatty acid esters obtained by esterification of triglycerides);
f) petroleum spirit (a distillate fraction having its boiling point in the 150°-220°C range).

By proper batching of there constituents, this invention will permit to obtain fuels with a low impact on the environment and in particular:

- pure vegetable gas oil
- semi-vegetable gas oil
- semi-vegetable fuel oil

the approximate formulation and average characteristics of which will be described hereinafter.

PURE VEGETABLE GAS OIL

This fuel is a proportionally variable mix of vegetable oil based alkyl esters (for example and only as a guide: 60% in weight), refined and/or unrefined vegetable oils (for example and only as a guide ranging between 30 and 40% in weight) and refined and/or unrefined vegetable oleins (for example and only as a guide ranging between 0 and 10% in weight).

The typical characteristics of the formulated product can he identified as follows:

- density at 15°C,	= 0.860-0.900 kg/lt (ASTM 1298)
- viscosity at 37.8°C,	= 2 - 7.4 cSt (ASTM D 445)
- sulphur % w	= none (ASTM D 1552)
- pp,	= 0 - 10°C (ASTM D 97)
- flash point	= min 55°C (ASTM D 93)
- Ash content	= max 0.01% (ASTM D 482).

This mixture of vegetable oil derived alkyl esters and/or vegetable oils or oleins permits to lower the viscosity and freezing point of the vegetable constituent so as to obtain a fuel having characteristics similar to those of heating oil but with the advantage of a virtually zero sulphur content.

The formula may also include a multi-purpose additive to provide the product with a better reaction against water separation, a stability reserve and compatibility at a lower freezing point.

From emission viewpoint it should be observed thatthese fuels contain no sulphur and will therefore not increase the SO2 content in the atmosphere, no hydrocarbons (to be considered as a warning sign for the emission of particulate matter) and, being of pure vegetable nature, they will not raise the carbon dioxide level in the atmosphere. This may also be a considerable adavantage in view of the tax on CO2 emissions proposed by EEC.

SEMI-VEGETABLE GAS OIL

This gas oil is a proportionally variable mix of sweet oil and/or petroleum spirit (for example and as a guide max. 70% in weight), refined and/or unrefined vegetable oils (for example and as a guide ranging between 20% and 30% in weight) and refined and/or unrefined vegetable oleins in a percentage ranging between 0 and 10% in weight.

The typical characteristics of this formula are identified as follows:

- density at 15°C	= 0.820-0.875 kg/lt (ASTM D 1298)
- viscosity at 37.8°C	= 2 - 7.4 cSt (ASTM D 445)
- sulphur content	= traces (ASTM D 1552)
- pp	= - 20°C (ASTM D 97)
- flash point	= min 55°C (ASTM D 93)
- ash content	= max 0.01% (ASTM D 482).

The mixing ratio of sweet oil and olein and/or vegetable oil is such as to permit the formulation of a fuel having the typical characteristics of heating oil.

The formula of this fuel may also include a multi-purpose additive to provide the product with a better reaction against water separation, a stability reserve and compatibility at a lower freezing point.

The mixture of sweet oil and oleins and/or vegetable oils permits to lower the viscosity and freezing point of the vegetable constituent so as to obtain a fuel having characteristics similar to those of domestic heating oil but with the advantage of having about the same sulphur content as sweet oil which is usually less than 0.1% in weight.

The presence of sweet oil also guarantees a fair stability reserve and compatibility with conventional gas oil and fuels.

As to fluxes released into the atmosphere, the consideration expressed above are also valid for pure vegetable oils except for same slight differences due to the presence of domestic kerosene.

SEMI-VEGETABLE FUEL OIL

This fuel oil is a proportionally variable mix of fossil fuel oil with a low sulfur content (for example and as a guide 60% in weight), vegetable oil (for example and as a guide ranging between 20% and 40% in weight) and refined and/or unrefined vegetable oleins (for example and as a guide ranging between 0 and 10%) possible with the addition of sweet oil and/or petroleum spirit (for example and as a guide ranging between 0-10% in weight).

The typical characteristics of this formula are identified as follows:

- density at 15°C	= 0.900-0.970 kg/lt (ASTM D 1298)
- viscosity at 50°C	= 2 - 7 °E (NOM 47)
- sulphur content	= max. 0.3% in weight (ASTM D 1552)
- pp	= - 9°C (ASTM D 92)
- flash point	= min 65°C (ASTM D 93)
- Ash content	= max. 0.05% in weight (ASTM D 482)
- water and sediments	= max 1% in volume (ASTM D 1796).

The considerations expressed above are also valid for this semi-fluid fuel as to its performance in terms of emissions at the stack with the additional advantage of its having a lower sulphur and asphaltene content than conventional fluid fuels, (as a guide: sulphur max 0.2 - 0.3% in weight, asphaltene max. 4% in weight for industrial purposes and max. 1.5% in weight for domestic heating) besides the very important advantage of having a very low metal content especially as regards Nickel and Vanadium.

The formula of this fuel may also include one or more multi-purpose additives to provide the product with a better reaction against water separation, a stability reserve and compatibility at a lower freezing point.

Claims

1. Fuels with a low impact on the environment *characterized* by the fact that they are derived from the following basic constituents:

   a) Sweet oil (distillate fraction having its indicatory boiling point ranging between 180° and 300°);
   b) fuel oil with a low sulphur content (complex mixture of hydrocarbons with less than 85% in volume volatile matter evaporating at 350°C and less than 1% in weight sulphur content;
   c) Refined and/or unrefined vegetable olein;
   d) Refined and/or unrefined vegetable oil obtained from oil producing plants of any kind whatsoever;
   e) Alkyl esters derived from vegetable oil (a mixture of fatty acid esters obtained by triglyceride esterification);
   f) petroleum spirit (distillate fraction having its indicatory boiling point in the 150° - 200°C range), properly dosed and batched so as to obtain a fuel with low impact on the environment and in particular:

   - pure vegetable gas oil
   - semi-vegetable gas oil
   - semi-vegetable fuel oil

   the combustion products of which have a low content of unburnt residues and carbon dioxide as well as no or very little sulphur and metals (Nickel, Vanadium, etc.).

2. Fuels as described in Claim 1, *characterized* by the fact that the pure vegetable gas oil is consisting of a mixture of alkyl esters derived from vegetable oils (for example and as a guide 60% in weight), refined and/or unrefined vegetable oils (for example and as a guide ranging between 0% and 40% in weight) and refined and/or unrefined vegetable oleins (for example and as a guide ranging between 0 and 10% in weight) featuring the following average characteristics:

- density at 15 °C	= 0.860 - 0.900 kg/lt (ASTM D 1298)
- viscosity at 37.8°C	= 2 - 7.4 cSt (ASTM D 445)
- sulphur % in weight	= none (ASTM D 1552)
- pp	= - 10°C (ASTM D 97)
- flash point	= min 55°C (ASTM D 93)
- Ash content	= max 0.01% in weight (ASTM D 482)

3. Fuels as described in Claim 1, *characterized* by the fact that this semi-vegetable oil is consisting of a mixture of sweet oil and/or petroleum spirit (for example and as a guide max 70% in weight), refined and/or unrefined vegetable oil (for example and as a guide ranging between 20% and 30% in weight) and refined and/or unrefined vegetable oleins (for example and as a guide ranging between 0 and 10% in weight), having the following characteristics:

- Density at 15°C	= 0.820 - 0.875 kg/lt (ASTM D 1298)
- viscosity at 37.8°C	= 2 - 7.4 cSt (ASTM MD 445)
- sulphur content % in weight	= traces (ASTM D 1552)
- pp	= - 20°C (ASTM D 97)
- Flash point	= min 55°C (ASTM D 93)
- Ash content	= max 0.011 % in weight (ASTM D 482)

4. Fuels as described in Claim 1, *characterized* by the fact that the semi-vegetable heavy fuel oil is consisting of a mixture of fossil fuel oil having a low sulphur content (for example and as a guide 60% in weight), vegetable oil (for example and as a guide ranging between 20% and 40% in weight), refined and/or unrefined vegetable oleins (for example and as a guide ranging between 0 and 10% in weight), possibly with the addition of sweet oil and/or petroleum spirit (for example and as a guide ranging between 0 and 10% in weight), having the following characteristics:

- density at 15%	= 0.900 - 0.970 kg/lt (ASTM D 1298)
- viscosity at 50°C	= 2 - 7 E (NOM 47)
- sulphur content	= max 0.3% in weight (ASTM D 1552)
- pp	= -9°C (ASTM D 97)
- flash point	= min 65°C (ASTM D 93)
- Ash content	= max 0.05% in weight (ASTM D 482)
- Water and sediments	= max 1% in volume (ASTM 1796)

5. Fuels as described in claim 1, *characterized* by the fact that one or more additives may be added to the basic constituents to prevent water separation, to improve their stability and compatibility and to lower their freezing point.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 10 2745

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	GB-A-2 099 449 (ERNER)		C10L1/02
A	WO-A-92 20761 (SCHUR)		
A	FR-A-2 492 402 (IFP)		
A	GB-A-2 127 433 (DIMATERA ET AL)		
A	DE-A-29 30 220 (LANDWIRTSCHAFTSKAMMER SCHLESWIG-HOLSTEIN)		
A	DE-A-41 35 294 (TESSOL KRAFTSTOFFE, MINERALOLE UND TANKANLAGEN)		
A	DATABASE WPI Section Ch, Week 8401 Derwent Publications Ltd., London, GB; Class H06, AN 84-002993 & JP-A-58 198 590 (SANKYO YUKI KK) , 18 November 1983 * abstract *		TECHNICAL FIELDS SEARCHED (Int.Cl.6) C10L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	9 February 1996	De Herdt, O

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
O : non-written disclosure
P : intermediate document

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

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