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(54) Process for the preparation of stable mixtures of coal and oil.

(57) A process is disclosed for the preparation of stable mixtures of coal and oil comprising the following steps:

- a) grinding of the coal down to a particle size lower than 200 µm;
- b) mixing of ground coal with water;
- c) mixing of moisturized coal with oil, a mixture being obtained with coal content not greater than 50% by weight, and with a water content not greater than 20% by weight relatively to the mixture itself;
- d) homogenizing by fine subdivision of the components of the mixture as under point (c).

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The present invention relates to a process for the preparation of stable mixtures of coal and oil, using water as the stabilizer additive.

5 The use of coal is presently hindered to a determining extent by the need of substantial investments having to be done to the purpose of modify the fuel combustion, storage and handling systems.

Due to this reason, technologies are being developed whose purpose is of transforming coal into a product
10 which can be used with the same technologies employed for the traditional fuel oils deriving from petrol.

One of such technologies is that of producing mixtures of coal and fuel oil.

Such mixtures, in order to be able to replace fuel
15 oil, must fulfil certain requirements, such as the pumpability and the stability.

The processes presently used are of two types.

The first type consists in accomplishing a ultra-fine grinding of the coal, so as to produce a colloidal suspension.
20 Such a type of process requires high investment and operating costs for the ultra-grinding, and requires as well the use of equipment which is not yet completely reliable from the constructive viewpoint.

The second type consists in the use of suitable
25 stabilizer additives, and its main drawbacks are on one hand the cost of the additives, on the other hand the need that for each of oil/coal couple the most suitable additive is to be selected.

Recently, as the stabilizer agent water has been
30 used.

A known process using water as the stabilizer additive consists in grinding coal down to particle size comprised within the range of from 3 to 6 mm, mixing it with water, mixing the water-coal mixture with oil and
5 finally grinding the mixture formed down to 0.5 mm.

We have found a process for the preparation of coal-oil mixtures by means of which, besides reaching a sufficiently high stability of the mixture, one has notably lower costs than by the other processes.

10 The process which is the object of the present invention comprises the following steps:

- a) grinding of coal down to a particle size lower than 200 μm ;
- b) mixing of ground coal with water;
- 15 c) mixing of moisturized coal with oil, a mixture being obtained whose coal content is not higher than 50% by weight and whose water content is not higher than 20% by weight relatively to the mixture itself;
- d) homogenizing of the mixture as under point (c) by means
20 of the fine subdivision thereof.

The homogenizing can be obtained by means of the impact of the mixture containing water, coal and oil against a surface preferably perpendicular to the flow direction of the mixture itself.

25 It is preferable to grind to coal in such a way that at least 80% be of particle size lower than 100 μm , then mixing it with water in an amount preferably comprised between 22 and 23%, still more preferably of 22,2% by weight relatively to coal.

30 The water content in the mixture as under point (c) is preferably comprised within the range of from 8 to 12%

by weight relatively to the mixture itself.

The usable oil can be fuel oil.

An Example is reported to the purpose of better illustrating the inventions.

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Example

A coal was ground down to the following granulometry:

100%	100 mesh
80%	200 mesh
40%	325 mesh

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The coal ground has been mixed first with water in an amount of about 22.2% by weight relatively to the coal and then with heavy fuel oil; the mixture formed has been homogenized by means of the emulsifier equipment schematically shown in herewith enclosed figura, a brief explanation of which is now given.

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The mixture of coal, oil and water (1) enters, delivered under pressure, the equipment, runs through the feeding duct (2), then through the convergent cone-frustum shaped duct (3), subsequently at high speed through the duct of constant section (4), and penetrates then into a chamber (5), called plenum chamber, of cylindrical shape with movable adjustable bottom (6), going to collide with the same bottom of said chamber.

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After the collision, the mixture passes from the plenum chamber through a plurality of holes (7) uniformly distributed in the lateral wall (8) of said chamber into a discharge chamber (9) annular and coaxial to the said plenum chamber and leaves (10) the device.

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The discharge chamber is bounded by the outer wall of the plenum chamber and by a cylindrical manifold (11). The feeding duct, the cone-frustum shaped duct and the

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duct of constant section are made in two blocks (12) and (13).

The movable adjustable bottom allows the length and obviously the volume of the plenum chamber to be varied
 5 above all on the basis of the flow rate and of the composition of the mixture.

With (14) a nut is schematically shown for the locking of the movable bottom of the plenum chamber, with (15) the angle comprised between the major base and the lateral
 10 wall of the cone-frustum shaped duct is shown.

The dimensions of the emulsifier used are the following:

diameter of the constant-section duct	2	mm
length of the constant-section duct	10	mm
15 diameter of the cone-frustum shaped duct		
major base	12.4	mm
length of the cone-frustum shaped duct	3	mm
diameter of the holes	5	mm
length of the plenum chamber	35	mm
20 diameter of the plenum chamber	15	mm
angle between the major base and the lateral wall of the cone-frustum shaped duct	60°	

The diameter of the plenum chamber and the diameter of the constant-section duct have been so selected, as to
 25 obtain a 5 bar drop in mixture pressure between the inlet of the constant-section duct and the plenum chamber.

A stable mixture with the following composition has been obtained:

fuel oil	45% by weight
30 coal	45% by weight
water	10% by weight

C l a i m s

1. Process for the preparation of stable coal/oil mixtures characterized in that it comprises the following steps:

- 5 a) grinding of coal down to a particle size lower than 200 μm ;
- b) mixing of ground coal with water;
- c) mixing of moisturized coal with oil, a mixture being obtained whose coal content is not higher than 50% by weight and whose water content is not higher than 20% by weight relatively to the mixture itself;
- 10 d) homogenizing of the mixture as under point (c) by means of the fine subdivision thereof.

2. Process according to claim 1 wherein 80% of coal is ground down to a particle size lower than 100 μm and water is admixed to coal in an amount comprised within the range of from 22 and 23% by weight relatively to coal.

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3. Process according to claim 1, wherein the fine subdivision of the components takes place by means of the impact of the mixture against a surface.

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4. Process according to claim 3, wherein the impact surface is perpendicular to the flow direction of the mixture.

5. Process according to claim 1, wherein the oil mixed with moisturized coal is fuel oil.

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6. Process according to claim 2, wherein water is admixed to coal in an amount of 22.2% by weight relatively to coal.

7. Process according to claim 1, wherein water is comprised within the range of from 8 to 12% by weight

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relatively to the total mixture.

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