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(54) Briquetting method

(57) Briquetting process using crushing process, **characteristic in that**, it is used preferably brown coal, which is crushed in the first step preferably to a fraction of less than 6 mm, in a second stage calcium compounds are added to 10% of weight of the total mixture, and the mixture preferably is mixed in a container and then it is evenly transmitted to the press, where it is the com-

pressed under high pressing pressure to 200 MPa, preferably 150 MPa, and the briquettes are subjected to seasoning, preferably a few days of and / or briquettes are dried on a moving belt classifier and / or briquettes are heated to a temperature of 200 ° C and / or briquettes are warmed by infrared lamps preferably during 5 minutes.

Description

[0001] The present invention is the briquetting method. **[0002]** Coal briquetting processes are known for over a century. In the initial stage of briquetting fine coal was formed into briquettes using different types of bonds, mostly tar, pitch or asphalt. After plenty of tests and having found the relationship between human health and the distillates of coal gas contained in the bonds, briquetting of coal lost its popularity.

[0003] In recent years, some studies were conducted to develop production of ecological bonds which do not endanger human health, such as starch, synthetic polymers, clays, cements or the by-products in the form of the pulp in paper industry. Considering the impact of high prices of the factors connected to the cost of production of briquettes, a research on briquetting techniques was started; those techniques are based on high pressure and temperature without the use of bonds.

[0004] From the Polish patent No. 340 129 is well-known a method and device for the production of briquettes from fine coal. The present invention is a method and device for the production of fuel briquettes from fine coal. The essence of the method is that the coal charge with grains of no more than 20 mm in an amount of from 50 to 90% of weight is added to from 5 to 15 % of weight of cement, from 2 to 5% of weight of substances reducing emissions of harmful volatile matters, and from 5 to 15% of weight of wooden sawdust. These components are mixed with each other and with a small amount of liquid, and then they are compressed bilaterally at ambient temperature, and finally they are subjected to seasoning at a temperature of 320-370 K for a period of from 2 to 8 hours. The essence of the device is using several charging containers and work containers that are the extension of charging containers which are parallelly mounted on a support frame, inside containers there are movable, specially shaped elements, connected by means of connectors and horizontal beams with the double-acting actuators.

[0005] From the Polish patent No. 336186 is well-known a method for preparing the mixture for the production of low-carbon briquette fuel. The method proceeds in two stages: I-Preparation of the bond, based on mixing baking fine coal with a grain size of less than 2 mm and at least 50% less than 0.5 mm or fotoconcentrate of baking carbon with known binders of natural origin in a weight ratio of from 5: 1 to 2: 1, with simultaneously heating of the mixed ingredients; II- dispensing of prepared bond to fragmented carbonaceous material derived from partly degassed natural coal, in a weight ratio of from 1: 2 to 1: 5. In I stage the hardening substances of natural binders are added, and in II stage the components of increasing usability of the briquettes are added.

[0006] From the Polish patent No. 402055 is well-known a method for briquetting of loose materials, especially of fine coal. A method for briquetting of loose materials, especially of fine coal, by a two-component glue

whose A component is natural multimolecular alcohol, modified by an inorganic acid or its salt, and component B is ureaformaldehyde resin with a molar ratio, urea: formaldehyde = 1: 1.6 (± 0.25) is that the component A is first applied on the sized material, thoroughly mixed, then the component B is mixed, then all is re-mixed and briquetted. Component A is a composition consisting of 1 weight part of acidic POSULFITOWY liquors containing in its composition of 55% of magnesium-sodium LIGNINOSULFONIAN to which 0.178 weight parts of urea is added and it is acidified with sulfuric acid to pH 3.0, and component B is a known methylol urea-formaldehyde resin which is a 50% aqueous solution having a molar ratio of urea-formaldehyde = 1: 2.2.

[0007] From the Polish patent No. 400894 is well-known a method for producing fuel briquettes and device for the production of fuel briquettes. The present invention is fuel briquettes, based on the use of a mineral glue, obtained on the basis of cement, which is in an amount of from 1 to 40% of weight which is mixed with the feedstock in an amount of from 99 to 60% of weight, consisting of fine coal, waste material, additives purifying toxic smoke from exhaust gases and increasing the calorific content. After mixing the components, briquettes with certain shapes are extruded. The device for the production of fuel briquettes, is composed of a vibrating table, next to which a solid rack is mounted, provided at the top of the with rotation axis, on which two arms are placed, one arm is connected with the mould, and the second arm is connected with squeezer with the frame structure.

[0008] From the Polish patent No. 400956 is well-known a method for producing pellets from sawdust with increased calorific value. A method for producing fuel pellets from sawdust with increased calorific value is based on mixing sawdust, wood shavings with additives in the form of: overdue porridge, chaff, broken grains, spent oil, etc. which are subjected to grinding of larger fractions, drying, dosing additives, averaging, forming and cooling. It is characteristic that the sawdust with a moisture content of 50-70% and the crushed wood chips, is subjected to drying and then mixing the additives increasing calorific value and stabilizing the quality of the final product, preferably in proportions of 1/85, and it is subjected to a pre-drying to the moment of reaching the moisture of mixture at a level 14-16%, preferably at a temperature of about 400 ° C for about 1 hour. Then, it is subjected to the averaging process of weight to the moment of reaching portion of sawdust constituting 85 to 98% of the mixture and in the final stage the used oil is dispensed to obtain the desired consistency and it is subjected to activation of steam at a temperature of about 120-150 ° C, by a natural binder in the form of precipitated lignin from the organic plant material, the process of breaking weight in equal portions is conducted and it is subjected to granulation is by forming at a high temperature of 100-120 ° C to reaching a diameter of 8-12 mm. It is subjected to a cooling process at the time of about 5-10 min, to a temperature of about 20°C, and it is sub-

jected to removing fractions which are not pelletized.

[0009] From the international patent application No. WO 2008/100147 A1 is well-known a method for producing fuel based on peat briquettes, the method is based on: using wet peat bog deposits as a natural raw material, this type of peat foundation with a moisture content in the range of 80-95% of weight, influences on the formation of peat to form a spherical or substantially spherical form and drying spherical units, to obtain a product with a maximum moisture content of 12% of weight. A characteristic feature of this method is that it also comprises: mixing the wet peat with the at least one biological fiber material absorbing moisture having a moisture content less than the moisture content of the wet peat.

[0010] From the international patent application No. WO 93/11339 is well-known a method for producing briquettes from peat with soil layers, and a device for carrying out the method. The devices includes a milling tool which is designed to remove peat from the upper surface of the substrate, tearing the middle of it, wherein the peat is received by the milling tool, and is finely divided by cutting elements which affect on the sediments of cutting stress in the peat to lead to its viscous state, and also artificial state in pressure chambers in which the viscous plastic material in the form of peat is compressed, and in an starting state, by which the peat is created to the form of briquettes.

[0011] From the international patent application No. WO 2014/071448 A1 is well-known a method for briquetting of crushed coal material. The method comprises reducing the moisture content of the material in the form of carbon particles from at least a specified maximum total level of moisture and making one or more intermediate briquetting processes including making crushed carbonaceous material in the intermediate briquetting device to the intermediate device for the manufacture of briquettes and forming between them material from agglomerate of particles of carbonaceous material and crushing the intermediate material. The method is also based on the final processing of the briquette including leading the crushed coal material by intermediate crushing of material gathered in the final device for briquetting and operating the final briquette device and leading to crushed coal material under certain pressure in order to press coal material in the form of particles of formed briquette of final product.

[0012] The purpose of the invention is to develop a new method of briquetting using the crushing process.

[0013] The process according to the invention, characteristic in that, it is used preferably brown coal, which is crushed in the first step preferably to a fraction of less than 6 mm, in a second stage calcium compounds are added to 10% of weight of the total mixture, and the mixture preferably is mixed in a container and then it is evenly transmitted to the press, where it is the compressed under high pressing pressure to 200 MPa, preferably 150 MPa, and the briquettes are subjected to seasoning, preferably a few days of and / or briquettes are dried on a

moving belt classifier and / or briquettes are heated to a temperature of 200 ° C and / or briquettes are warmed by infrared lamps preferably during 5 minutes.

[0014] The advantage of the invention is that the grain coal is used for briquetting. Briquetting is based on concentration by pressing under high pressure of portion of the grain material resulting in displacement of the fluid from the intergranular space, and thus approach of grains to each other. Briquetting pressure depends on the composition of the feed grain, which is a mixture of brown coal, fotoconcentrate and calcium to reduce SO₂ energy. By granulating of feed of 0-6 mm and total moisture of approx. 15%, pressing pressure should be around 150 MPa.

[0015] Briquettes produced by the method according to the invention are used for combustion in the grate boilers and furnaces of small and medium power.

[0016] The invention is explained in the following examples.

Description of the briquetting process in cylindrical briquetting devices:

[0017] The feed, which is a brown coal is directed to the screen equipped with a sieve with the openings of 40 mm. The top product of screen is directed to impact crusher and a bottom product and the product from crusher are combined and directed to screen equipped with string - harp sieves with openings of 6 mm. The top product is directed to a further crushing and is combined with the bottom product of 0-6 mm. The material is directed to the reservoir where fotoconcentrate and calcium compounds are added in appropriate proportions. The reservoir is equipped with a dispenser evenly transmitted the feed to the press. Press consists of two rolls rotating towards the inside and in contact with each other. The feed is fed to the working space in the contact area of both rollers. Rollers are equipped with operating segments with recesses forming with the suitably selected sh feed is a material difficult to thicken. Briquettes are received from the press by means of a suitably constructed conveyor which is a classifier to eliminate briquettes that have and are disintegrated. Then the briquettes are subjected to seasoning for a few days for improving the mechanical strength.

Example 1 (brown coal with a mixture of 5% calcium compounds)

[0018] Brown coal, which is crushed in the first stage to the fraction of less than 5 mm, in a second stage, the calcium compounds are added 5% of weight of the total mixture, then they are stirred in the reservoir.

[0019] Then, the feed is evenly transmitted to the press, where the it is compressed under high pressing pressure of 150 MPa, and the briquettes are subjected to seasoning for 4 days.

Example 2 (fine coal finely milled - coal with calcium compounds 6% of weight of the total mixture and modified starch 4% of weight of the total mixture)

[0020] To finely grounded fine coal (fromcoal) having a fraction of up to 2 mm, calcium compounds are added 6% of weight of the total mixture and a modified starch 4% of weight of the total mixture, and the mixture is stirred in the reservoir. Then, the feed is evenly transmitted to the press, where the it is compressed under high pressing pressure of 150 MPa, and the briquette are then dried on a moving belt classifier.

Example 3 (anthracite with fraction of 0 - 2 mm, together with modified starch compounds 6% of weight of the total mixture)

[0021] Anthracite, which in the first stage is crushed to the fraction / feed below 0 - 2 mm, in a second stage the modified starch compounds 6% of weight of the total mixture are added, and the mixture is stirred in the reservoir. Then, the feed is evenly transmitted to the press, where it is compressed under high pressing pressure of 150 MPa and the briquettes are heated up to 200 ° C.

Example 4 (fotoconcentrate with the feed of less than 0 - 2 mm, together with the modified starch 4% of weight of the total mixture and calcium compounds 6% of weight of the total mixture)

[0022] To fotoconcentrate with the feed below to 0 - 2 mm, a modified starch to 4% of weight of the total mixture and the calcium compounds to 6% of weight of the total mixture are added, and the mixture is stirred in the reservoir. Then, the feed is evenly transmitted to the press, where it is compressed under high pressing pressure of 150 MPa and the briquettes are warmed up by infrared lamps for 5 minutes.

Example 5 (sawdust 5% of weight of the total mixture and fine coalt with modified starch 6% of weight of the total mixture)

[0023] To sawdust 5% of weight of the total mixture, and fine coal being the rest of the coal, a modified starch 6% of weight of the total mixture is added. The mixture is stirred in the reservouir. Then, the feed is evenly transmitted to the press, where it is compressed under high pressing pressure of 150 MPa and the briquettes are dried on a moving belt classifier and warmed up by infrared lamps for 5 minutes.

Example 6 (sawdust to 5% of weight of the total mixture and fotoconcentrate to 95% of the total mixture and the modified starch 6% of weight of the total mixture)

[0024] To sawdust 5% of weight of the total mixture,

and fine coal being the rest of the coal, a modified starch 6% of weight of the total mixture is added. The mixture is stirred in the reservoir. Then, the feed is evenly transmitted to the press, where it is compressed under high pressing pressure of 150 MPa and the briquettes are dried on a moving belt classifier with simultaneously heating to 200 ° C and they are warmed up by infrared lamps for 5 minutes.

10 Claims

1. Briquetting process using crushing process, characteristic in that, it is used preferably brown coal, which is crushed in the first step preferably to a fraction of less than 6 mm, in a second stage calcium compounds are added to 10% of weight of the total mixture, and the mixture preferably is mixed in a container and then it is evenly transmitted to the press, where it is the compressed under high pressing pressure to 200 MPa, preferably 150 MPa, and the briquettes are subjected to seasoning, preferably a few days of and / or briquettes are dried on a moving belt classifier and / or briquettes are heated to a temperature of 200 ° C and / or briquettes are warmed by infrared lamps preferably during 5 minutes.
2. A method according to claim 1, characteristic in that, in place of using carbon anthracite, coal sludge, sawdust, fotoconcentrate is used.
3. A method according to claim 1, characteristic in that, as the calcium compounds lime and / or modified starch compounds are used.

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EUROPEAN SEARCH REPORT

 Application Number
 EP 14 46 0130

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10	X WO 2009/147360 A1 (SOLSYS LTD [GB]; MCGOLDRICK FREDERICK [IE]) 10 December 2009 (2009-12-10) * page 19, line 1 - page 21, line 14; claim 1 * * page 10, line 16 - page 14, line 29; figure 1 * * page 4, line 29 - page 7, line 18 * -----	1-3	INV. C10L5/36 C10L5/12
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20	X CN 103 468 341 A (ZHU QUBO) 25 December 2013 (2013-12-25) * abstract; claims 1-7; example 5 * -----	1-3	
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50	1 The present search report has been drawn up for all claims		
55	Place of search The Hague	Date of completion of the search 28 April 2016	Examiner Bertin, Séverine
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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