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(54) **An apparatus for and a method of drying and hot briquetting of metallic particles.**

(57) In the hot briquetting of cast iron particles the cast iron particles are supplied to a furnace in which they are heated to the plastics range. Prior to reaching the furnace, carbon is added to the particles. The hot particles leaving the furnace are pressed into briquettes. The addition of carbon to the particles substantially increases the carbon content of the briquettes on furnace re-melt.

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"AN APPARATUS FOR AND A METHOD OF DRYING AND HOT BRIQUETTING OF METALLIC PARTICLES"

This invention relates to an apparatus for and a method of drying and hot briquetting of metallic particles whether ferrous or non-ferrous.

Within the last few years, apparatus has been devised for hot briquetting of cast iron particles such as borings. In this apparatus particles of cast iron produced for example when cast iron is machined (such borings are often known as "chips") are fed to a furnace where they are heated to the temperature at which they are plastic but not to the temperature at which they melt. Supply means are normally provided for supplying the cast iron particles to the furnace at a controlled rate and generally the apparatus also includes a vibratory screen for vibrating the cast iron particles prior to their supply to the furnace to remove undesired (tramp) particles. The hot particles are discharged from the furnace to a press where they are

compacted into briquettes. The briquettes thus produced are sold to a manufacture of cast iron and are normally re-melted in a cupola or an arc or induction furnace to produce foundry castings.

In the furnace any moisture which the particles contain is vapourised and driven off as steam. Further, any oil which the chips contain also vapourises and is burnt or driven off. The percentage by weight of oil may vary enormously and the combustion of the vapourised oil does of course require some of the oxygen in the atmosphere of the furnace. The atmosphere of the furnace is desirably a reducing atmosphere in order to prevent oxidisation of the carbon in the particles as oxidisation of the carbon in the chips reduces the carbon content of the resulting briquettes below that which is desirable in subsequent use. Attempts have been made to control the air flow to the furnace to ensure that at all times the furnace atmosphere is a reducing atmosphere but difficulties have been encountered in providing adequate control and some carbon oxidation usually occurs. This problem is aggravated due to the mechanical handling of the particles by the supply means and the vibratory screen as the mechanical handling of the particles tends to remove the free carbon atoms from the particles reducing the overall carbon content of the particles. In practice, the final user of the briquettes prefers a minimum carbon level in the briquettes.

It is an object of this invention to provide hot briquetting apparatus for metallic particles which allieviates the problem described above.

According to this invention, hot briquetting apparatus for ferrous or non-ferrous metallic particles is characterised in that it comprises means for adding

carbon to the particles prior to their supply to the furnace.

The carbon is preferably supplied in the form of a powder, preferably, 0 to 3 mm grade.

The addition of the carbon to the metallic particles prior to their supply to the furnace has the advantage of increasing the carbon content in the final briquettes whatever the original carbon content and whatever the atmosphere in the furnace and has the second advantage that the additional carbon supplied tends to limit the free carbon atoms in the particles from being oxidised should the atmosphere in the furnace be an oxidising atmosphere.

Preferably, the carbon added is up to 1% by weight of the weight of the particles.

Hot briquetting apparatus in accordance with this invention will now be described, by way of example only, with reference to the accompanying drawing, which is a side view showing the general arrangement of the apparatus.

The hot briquetting apparatus shown in the drawing is capable of producing 5,000 kilos per hour of hot briquetted cast iron particles.

Referring to the drawing, the chips 1 are loaded into a particle loading hopper 2 by a loading crane 3 and fall into a vibratory screen 4 where tramp particles are removed; the chute through which the tramp particles fall off is denoted at 5. The particles leave the vibratory screen 4 by falling onto a conveyor 6 which convey the particles to a large storage hopper 7, capable of holding 130,000 kilos of particles. The particles fall from the hopper 7 through a manual operated feed control gate 8 onto another conveyor 9 which feeds the particles to a small supply hopper 10.

The particles are fed out of the bottom of the supply hopper 10 into a screw feeder 11. The screw feeder 11 comprises a horizontal tube 12 containing an Archimedian screw driven at a variable speed. At an inlet point 13, carbon powder is metered into the tube 12 at a controlled rate. The feed tube 12 supplies the particles with carbon powder to the lower chamber 14 of a furnace 15 which functions to burn off oils in the particles and to drive off moisture. The furnace 15 contains an upper chamber 16 in which combustion of vapourised oil takes place and from which gases are exhausted into a gas stack 17.

The dried and heated particles fall from the lower chamber of the furnace through a discharge chute 18 into a briquetting press 19 of conventional construction. The briquettes fall from the press 19 onto an output conveyor 20 and are then supplied to a briquette stewing conveyor 21 which feeds them to a store.

The particles 1 as originally supplied are less than 3/8 of an inch mesh. The carbon added is carbon 99 of 0 to 3 mm diameter of up to 1% by weight of the particles.

The particles entering the furnace are encapsulated in carbon powder.

Without the additional supply of carbon, the carbon content of the final briquettes would be from 2.8 to 3.2% on furnace re-melt. The additional injection of carbon changes the carbon content of the briquettes on furnace re-melt to 3.5% to 4% for example.

A typical analysis of the briquettes on furnace re-melt is as follows

Material	
Carbon	3.5 - 3.8%
Silicon	2%
Manganese	0.6%
Sulphur	0.12%
Phosphorus	0.05%
Nickel	0.06%
Chromium	0.2%
Copper	0.11%
Metal Recovery	92 - 95%

The density of the finally produced briquettes is typically 80 to 84% of the engineering quality iron grade 14. The radial crush strength of a typical briquette is 1,200 to 1,500 kg/cm. The breaking load of such a typical briquette is 6,500 to 7,800 kg.

The entry point of the carbon to the apparatus is shown at 13 but could be anywhere in the apparatus.

CLAIMS

1. Apparatus for hot briquetting of ferrous or non-ferrous metallic particles comprising means for supplying metallic particles to a furnace in which they are heated to the plastics range and a press for pressing the hot particles leaving the furnace into briquettes characterised by means for adding carbon to the particles prior to their reaching the furnace.

2. Apparatus according to claim 1 characterised in that the carbon is added so as to constitute up to 1% by weight of the particles entering the furnace.

3. A method of hot briquetting of ferrous or non-ferrous metallic particles comprising supplying metallic particles to a furnace in which they are heated to the plastics range and pressing the hot particles leaving the furnace into briquettes characterised by adding carbon to the particles prior to their reaching the furnace.

4. A method according to claim 3 characterised in that the carbon is added so as to constitute up to 1% by weight of the particles entering the furnace.

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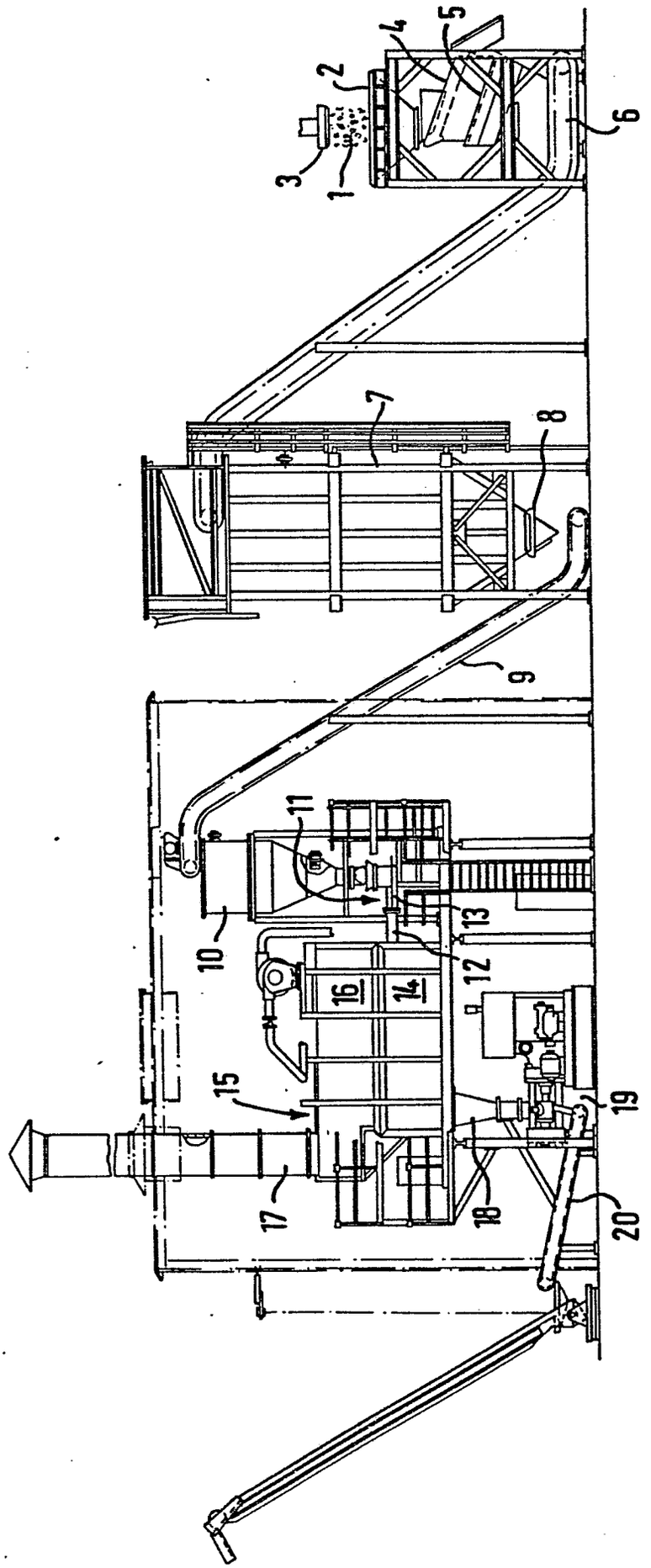

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EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	US - A - 2 252 697 (H.A. BRASSERT) * Claim 1; page 2, left-hand column, lines 44-67 *	1-4
	US - A - 2 457 861 (H.A. BRASSERT) * Claim 1; column 5, lines 35-44 *	1,3
	DE - A - 1 758 714 (AEROJET-GENERAL CORP.) * Claims 1,8,9 * & GB - A - 1 210 856	2,4

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

B 22 F 3/14
B 22 F 1/00
C 22 C 33/02

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

B 22 F
C 22 C
C 21 B

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24-04-1981	SCHRUERS

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