

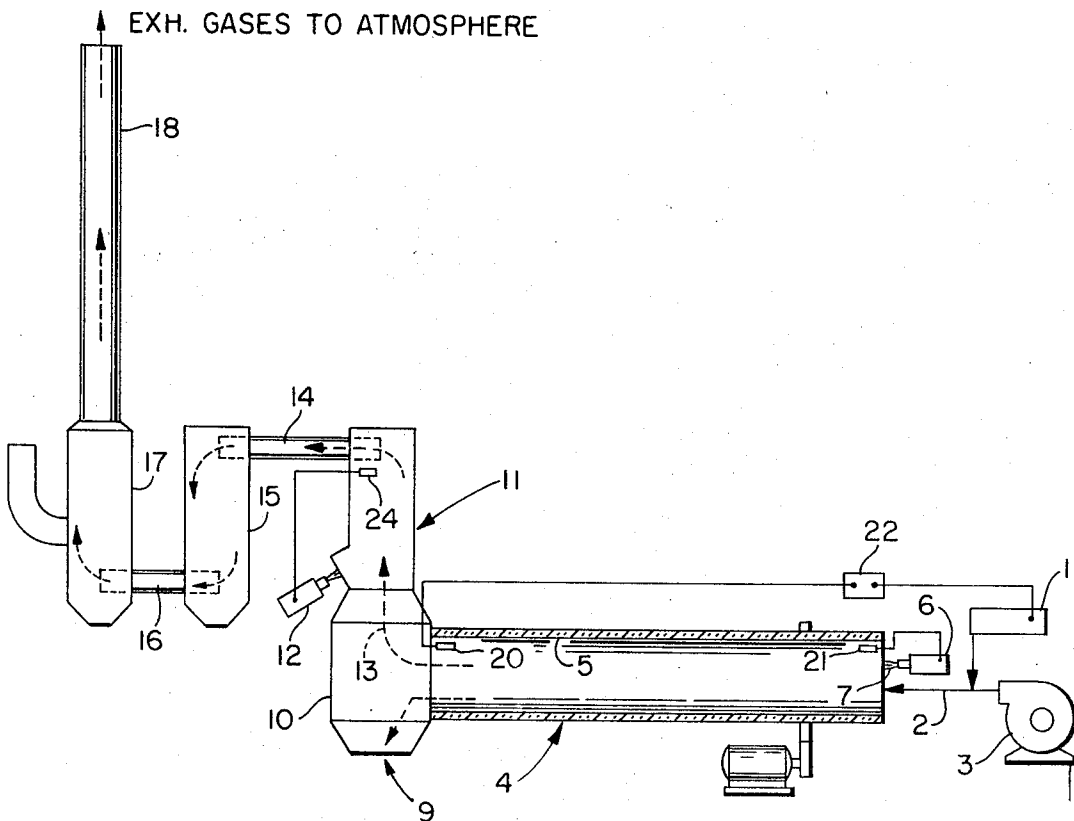
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METHOD AND APPARATUS FOR DE-OILING METAL CHIPS AND THE LIKE

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METHOD AND APPARATUS FOR DE-OILING METAL CHIPS AND THE LIKE

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1 Claim

ABSTRACT OF THE DISCLOSURE

Process and apparatus for de-oiling metal cuttings or chips in which such chips pass through a refractory lined rotary cylinder, the feed rate of the chips to such cylinder being controlled by the temperature of the combustion products at the discharge end of the cylinder while the burner at the feed end of the cylinder is controlled by the temperature of the combustion products at such feed end.

This invention relates generally as indicated to method and apparatus for de-oiling chips, cuttings, borings and the like. Such chips are covered with cutting oils and other volatile matter which must be removed. With this invention a process and apparatus is provided which provides complete combustion meeting all anti-pollution codes. Incomplete combustion not only produces smoke but also increases the possibility of explosion in the system.

In cutting or chip de-oiling systems, it is difficult to maintain the proper exhaust temperature due to variation in oil content on the chips, and the proper relationship between such exhaust temperature and the amount of metal particles in the combustion zone.

Different types of cuttings or chips may have different amounts of oil or other volatile products thereon and this, of course, affects the temperature of the combustion products quite apart from the temperature of metal chips or cuttings in the combustion zone. It is therefore important in high temperature de-oiling to maintain proper temperature control, not only in the combustion zone to prevent fusion of the metal chips, but also in the exhaust system to ensure complete combustion eliminating smoke in the products exhausted to atmosphere.

It is accordingly a principal object of the present invention to provide a process and apparatus for the de-oiling of metal chips and the like which results in complete combustion of the cutting oils and other volatile matter and yields a metal chip at high temperature suitable for hot briquetting or cooling.

Another important object is the provision of such process and apparatus which will maintain the proper temperature, oil content relationship in the combustion zone reducing smoke and eliminating the possibility of explosion in the system.

A further object is the provision of a process and apparatus utilizing a rotary refractory lined cylinder which includes a control which is responsive to the oil content of the metal chips therein inversely to vary the feed rate.

Another object is the provision in such process and apparatus of an after-burner to complete combustion of the exhaust gases leaving the combustion zone, and a wet scrubber to remove any fines.

Yet another object is the provision of such process and apparatus using a rotary refractory lined cylinder having a primary temperature control measuring the temperature of the combustion products at the discharge end of such cylinder inversely to change the feed rate of the metal particles into such cylinder.

Other objects and advantages of the present invention

will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claim, the following description and the annexed drawing setting forth in detail a certain illustrative embodiment of the invention, this being indicative, however, of but one of the various ways in which the principles of the invention may be employed.

In said annexed drawing there is illustrated schematically a preferred apparatus for practicing the process of the present invention.

Referring now to said annexed drawing, the metal particles or chips such as turnings, borings, cuttings, etc., which are coated with cutting oils and other volatile matter, are fed by a controlled variable speed feeder 1 to a high velocity air stream 2 supplied by an air blower 3. The variable speed feeder 1 may, for example, be a motor driven screw, the discharge end of which is directly in the high velocity air stream 2. The air in such stream carries the metal particles into rotary cylinder 4 which may be provided with a refractory lining 5. A burner seen at 6 at the feed end of the cylinder 4 supplies flame 7 and high temperature air for burning the oil and volatiles within the combustion chamber provided by the cylinder 4.

The hot metal particles are discharged at 9 at the bottom of refractory lined hood 10. On the top of the hood 10 there is provided an after-burner 11 which includes a burner 12 supplying flame and high temperature air, if required, to complete the combustion of the exhaust gases entering the after-burner 11 from the cylinder 4 as seen by the arrow 13.

From the top of the after-burner, the final products of combustion pass through horizontal conduit 14 into the top of pre-cooler 15 and then through conduit 16 at the bottom of the pre-cooler into wet scrubber 17 where the gases are sprayed with water to remove the dust and ash particles before the exhaust gases enter the stack 18 to be discharged to atmosphere.

The temperature of the combustion products in the rotary cylinder 4 is measured by two sensing units 20 and 21 extending into the cylinder, the former at the discharge end and the latter at the feed end of such cylinder.

Primary control is accomplished by using the signal from the temperature sensing device 20 at the discharge end of the rotary cylinder. When the oil or other volatile matter content of the metal particles drops, the temperature of the combustion products also drops. This temperature signal is then fed to controller 22 which in turn controls the speed of feeder 1. This increases the feed rate of the metal particles into the air stream 2 and thus the oil content into the cylinder. Conversely, when the oil content of the particles is high, the corresponding rise in the temperature of the combustion products within the cylinder 4 will signal the controller 22 through the sensor 20 to reduce the feed rate of the metal particles.

The secondary temperature control 21 within the rotary cylinder, using the temperature signal at the feed end of such cylinder, increases the output of burner 6 when the temperature of the combustion products drops and conversely reduces the burner output to a predetermined minimum when the temperature rises.

Through the primary temperature control sensor at the discharge end of the rotary cylinder there is thus provided a means responsive to the oil content of the metal chips inversely to vary the feed rate thereof into such cylinder. This control is, of course, obtained intermediately through the temperature of the combustion products which varies

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directly with the amount of such oil or volatile matter within the cylinder. The secondary control, at the feed end, maintains the burner output within a preselected range.

The temperature of the exhaust gases leaving the after-burner 11 is measured by sensing unit 24 and a drop in temperature at such point signals the burner 12 through a suitable controller to increase the heat output of the burner 12 located on the after-burner. Conversely, when the exhaust temperature rises, the output of the burner 12 drops maintaining the desired temperature range in such after-burner. Maintaining the proper exhaust temperature ensures complete combustion which eliminates smoke in the products exhausted to atmosphere.

With the noted apparatus and the temperature controls, the desired high temperature may be maintained to ensure complete combustion and thus de-oiling of the metal particles. Low temperatures would result in incomplete combustion producing smoke and increasing the possibility of explosion in the system.

It can thus be seen that there is provided a process and apparatus for the de-oiling of metal chips or particles providing positive and complete combustion of the volatiles while still meeting all of the anti-pollution codes.

Other modes of applying the principles of the invention may be employed, change being made as regards the details described, provided the features state in the following claim or the equivalent of such be employed.

I claim:

1. A process for de-oiling metal chips comprising the

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steps of feeding such chips at a variable rate into a rotary cylinder, supplying high temperature flame and gases to the feed end of such cylinder through a burner to cause combustion of the oil on such chips, sensing the temperature of the combustion products in such cylinder at the discharge end thereof, varying the feed rate of such chips in response to such temperature at the discharge end thereof, and controlling the output of such burner in response to the temperature of the combustion products at the feed end of such cylinder, the step of feeding such chips being accomplished at a variable rate into a high velocity air stream and then into such cylinder.

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