

[54] **ROTARY KILN FOR METAL CHIP
DEOILING**

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[51] Int. Cl. **F27b 7/02**

[58] Field of Search **432/103, 105, 115, 117,
432/118, 72; 266/335**

[56] **References Cited**

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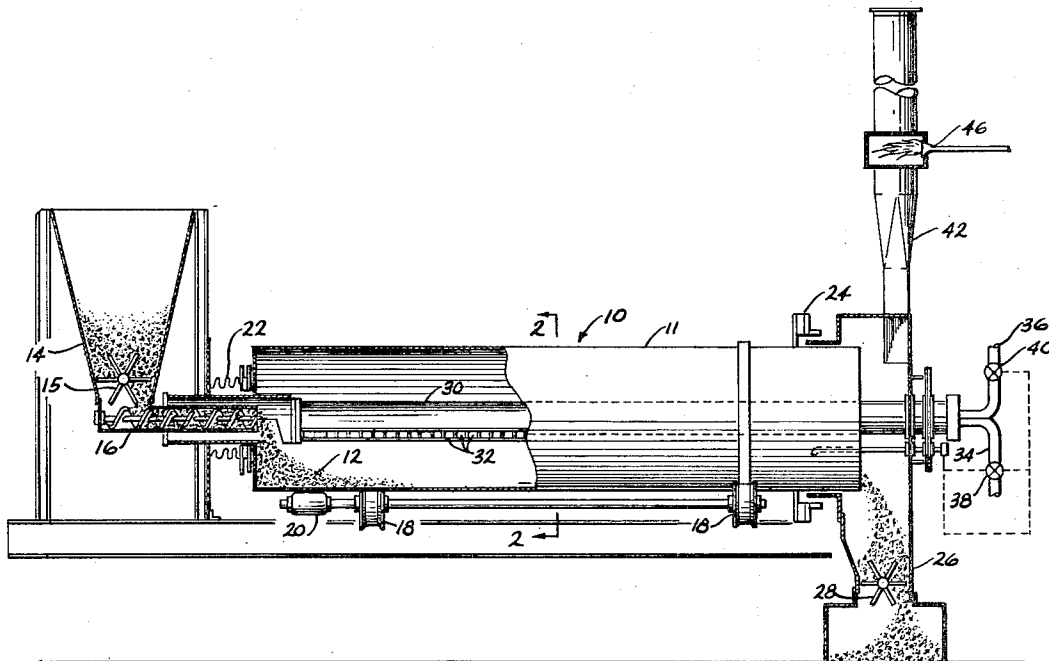
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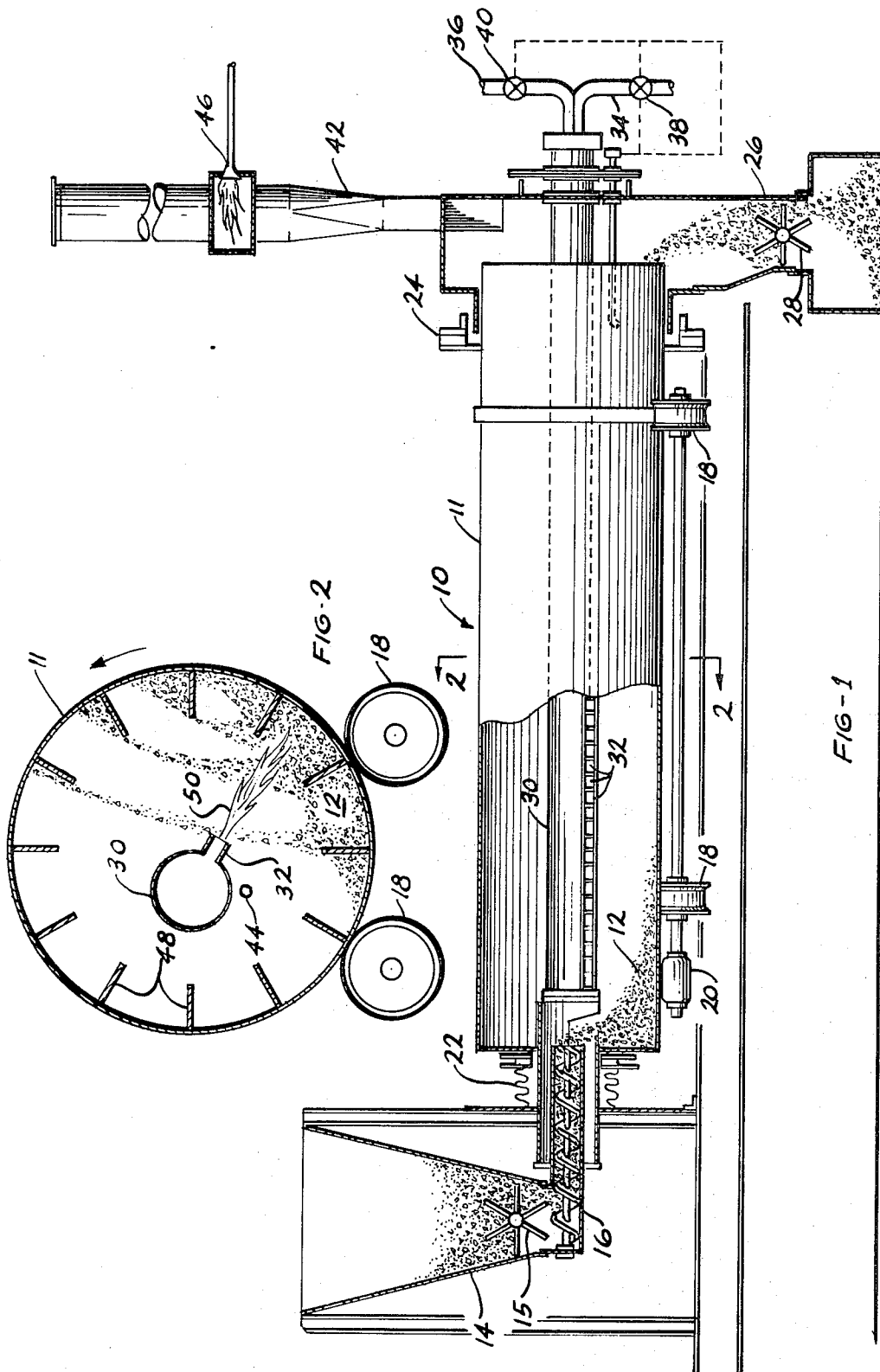
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[57] **ABSTRACT**

A rotary kiln in which oil and water can be removed from the metal chips in which a burner having outlets positioned throughout the length of the kiln introduces heat. The fuel to air ratio is adjusted such that no excess air is available in the kiln for combusting the oil coating on the chips. Thus the chips are subject to pyrolyzation in a reducing atmosphere, with the water and oil being vaporized and removed from the kiln along with the combustion exhaust gases.

1 Claim, 2 Drawing Figures





ROTARY KILN FOR METAL CHIP DEOILING

BACKGROUND OF THE INVENTION

In metal milling and drilling operations, huge amounts of metal chips and other small metal scraps are produced. Since most of the machining uses oil and/or water as lubricants, the metal chips contain a coating of oil and water which must be removed prior to reprocessing them. One method of accomplishing this in the past has been to heat the chips in a retort, using indirect heat, on the outside of the retort. Because of the low efficiency in this type of drying operation, it is expensive. Another method used is to burn the oil coating on the metal chips in a furnace. This causes undesirable oxidation of the metal chips, and also is subject to the hazard of explosion. In accordance with the present invention, a rotary kiln is provided for removing oil and water coatings from metal chips in an efficient manner without the hazard of furnace explosion or oxidation of the metal chips being treated.

SUMMARY OF THE INVENTION

The rotary kiln of the invention utilizes a burner having outlets extending throughout the length of the housing. The rotating housing has internal longitudinal ribs or vanes for causing the metal chips to cascade or tumble within the housing, thus providing good exposure of all surfaces of the chips to the drying medium. The air-fuel ratio of the burner is adjusted so no excess air is introduced into the furnace such that the chips are pyrolyzed in a reducing atmosphere. The water and oil is vaporized, and carried off with the combustion exhaust gases.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a cross sectional side view of a metal chip deoiler furnace or kiln constructed in accordance to the invention; and

FIG. 2 is a sectional view taken on lines 2—2 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, numeral 10 denotes the rotary kiln or furnace in its entirety. The kiln consists of a substantially horizontal cylindrical housing 11. The housing 11 is tilted slightly downwardly from its inlet end to the discharge end, so that as it rotates the metal chips 12 are progressively moved through the housing. Metal chips or scrap 12, coated with water and oil, is introduced to the furnace 11 from hopper 14 by means of a screw feeder 16. A rotary air lock 15 located in the bottom of the hopper 14 prevents undesirable air from entering the furnace along with the metal chips, so that the furnace can be maintained in an inert or reducing atmosphere.

Housing 11 is mounted on trunnion rolls 18, which rolls are driven by motor 20 to cause rotation of the housing 11. Bellows 22 forms a seal between the rotating housing 11 and the stationary structure 21, while permitting thermal growth of the housing when it is fired. A spring biased annular seal 24 prevents entrance of air at the discharge end of the housing 11. The chips, after having the water and oil evaporated therefrom in furnace 11, are discharged through opening 26. Rotary

air lock 28 prevents entrance of air to the furnace through the discharge opening.

Heat is provided in the furnace 11 by means of tubular burner 30, which contains openings 32 along its entire length for directing flame at the metal chips throughout the length of the furnace. Thus all of the metal chips contained in the kiln or furnace are continuously exposed to radiant heat throughout the length of the furnace. Burner 30 is supplied with gaseous fuel and air through supply lines 34 and 36, respectively. The ratio of fuel to air is maintained such that no excess air enters the furnace 11 through the burner 30. Thus no oxygen will be present in the furnace to support combustion of the oil coating the metal chips. Thus the oil and water is volatilized or vaporized, and carried out of the furnace along with the combustion exhaust gases through duct 42.

The amount of fuel and air supplied to burner 30 is controlled by valves 38 and 40, respectively. These valves are automatically adjusted by a signal from temperature sensing device 44 located in the furnace. A temperature of approximately 800°F to 1000°F is maintained in the furnace, so that all of the water and oil is vaporized, without causing overheating damage to the metal chips.

The volatilized combustibles coming from the evaporated oil is combusted by an afterburner 46, located in duct 42. This burner is supplied with an excess of air, to insure combustion of all of the vaporized oil carried by the furnace exhaust gases.

As best seen in FIG. 2, housing 11 has a plurality of longitudinal ribs or vanes 48 attached to its inner wall surface. These ribs 48 extend the entire length of the furnace, and provide a tumbling action for the metal chips as the housing rotates. Thus the flame 50 impinges directly on the shower of cascading metal chips, insuring that all of the surfaces of all chips are exposed to the drying effect of the flame 50. As shown in FIG. 2, the burner openings 32 are located off center to the vertical, to effectively direct the flame 50 at the greatest accumulation of cascading or tumbling chips.

From the above, it can be seen that a highly efficient furnace has been provided for removing the water and oil coatings from metal chips. Since the furnace atmosphere is inert, there is no possibility of explosion. Afterburner 46 combusts the vaporized combustibles carried by the exhaust gases leaving the furnace. If desired, the duct 42 can also contain a wet scrubber for removing pollutants from the exhaust gases prior to their being discharged to the atmosphere.

What is claimed is:

1. A furnace for removing oil and water from scrap metal including a substantially horizontally cylindrical housing, said housing having an inlet end and a discharge end, means for rotating the housing, said housing being angled slightly downwardly from the inlet end to the discharge end, means for introducing scrap metal to the housing at the inlet end, means for removing scrap metal from the housing at the discharge end, exhaust duct means through which the gases escape from the housing, afterburner means located in the duct means for combusting the combustible volatiles driven off from the scrap metal, a plurality of longitudinal vanes secured to the walls of the housing for causing tumbling of the scrap metal as the housing rotates, burner means positioned within the housing having outlets positioned longitudinally along the entire length of

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the housing, the outlets of the burner means being positioned at an angle to the vertical, and are offset from the central axis of the housing, such that the flames issuing therefrom impinge directly on the greatest accumulation of tumbling scrap metal, and means for controlling the supply of fuel and air to the burner means in such a ratio that no excess air is supplied to the housing, thereby exposing the scrap metal to pyrolysis in a reducing atmosphere.

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trolling the supply of fuel and air to the burner means in such a ratio that no excess air is supplied to the housing, thereby exposing the scrap metal to pyrolysis in a reducing atmosphere.

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