Abstract

Title of the Invention:-

"ROTARY PLOUGHS FOR GASIFIERS"

A solids handling equipment rotary plough (200) includes a metal body having a bottom (202) and a top (204), the metal body defining a pair of opposed spaced non-parallel elongate faces (302, 402) extending between the bottom (202) and the top (204) and from a first end (304, 404) to a second end (306, 406) of each opposed elongate face (302, 402), the first end (304, 404) and the second end (306, 406) being spaced further from each other than the top (204) and the bottom (202) are spaced from each other providing each opposed elongate face (302, 402) with a length greater than a height. The opposed elongate faces (302, 402) are on opposite sides and facing away from a first imaginary vertical plane (206), each of said opposed elongate faces (302, 402) having at least two elongate major surfaces (308, 408, 310, 410) which are not co-planar, an upper, elongate, non-vertical, major surface (308, 408) being angled towards the first imaginary vertical plane (206) to slope upwardly towards said first imaginary vertical plane at an angle of at least 1° to the vertical and a lower, elongate, vertical, major surface (310, 410) being angled in a horizontal plane at an angle of at least 2° relative to the lower, elongate, vertical, major surface (410, 310) of the other of the opposed elongate faces (402, 302) so that the first ends (304, 404) of the opposed elongate faces (302, 402) are closer to each other than the second ends (306, 406) of the opposed elongate faces (302, 402) are to each other rendering the opposed elongate faces (302, 402) diverging in a direction from the first ends (304, 404) towards the second ends (306, 406). The first end (304, 404) of each elongate face (302, 402) is on a common side of a second imaginary vertical plane (208) which is perpendicular to the first imaginary vertical plane (206) and which is thus located between the first end (304, 404) and the second end (306, 406) of each elongate face (302, 402). The opposed spaced non-parallel elongate faces (302, 402) are joined by a connector (210) defining mounting means (212, 214, 216) to mount the rotary plough (200) to a rotatable grate component, the mounting means (212, 214, 216) being located between the opposed non-parallel elongate faces (302, 402).

We Claim:

1. A solids handling equipment rotary plough, the rotary plough including a metal body having a bottom and a top, and defining a pair of opposed spaced non-parallel elongate faces extending between the bottom and the top and from a first end to a second end of each opposed elongate face, the first end and the second end being spaced further from each other than the top and the bottom are spaced from each other providing each opposed elongate face with a length greater than a height, the opposed elongate faces being on opposite sides and facing away from a first imaginary vertical plane, each of said opposed elongate faces having at least two elongate major surfaces which are not co-planar, an upper, elongate, non-vertical, major surface being angled towards the first imaginary vertical plane to slope upwardly towards said first imaginary vertical plane at an angle of at least 1° to the vertical and a lower, elongate, vertical, major surface which is angled in a horizontal plane at an angle of at least 2° relative to the lower, elongate, vertical, major surface of the other of the opposed elongate faces so that the first ends of the opposed elongate faces are closer to each other than the second ends of the opposed elongate faces are to each other rendering the opposed elongate faces diverging in a direction from the first ends towards the second ends, the first end of each elongate face being on a common side of a second imaginary vertical plane which is perpendicular to the first imaginary vertical plane and which is thus located between the first end and the second end of each elongate face, the opposed spaced non-parallel elongate faces being joined by a connector defining mounting means to mount the rotary plough to a rotatable grate component, said mounting means being located between said opposed non-parallel elongate faces.

2. The solids handling equipment rotary plough as claimed in claim 1, in which the metal body includes or is in the form of at least two separable parts or components, a first part or component defining one of the non-parallel elongate faces and a second part or component defining the other of the non-parallel elongate faces, and with each of the first and second parts or components defining at least a portion of the connector.

3. The solids handling equipment rotary plough as claimed in claim 2, which includes joining means to join the first and second parts or components of the metal body together.

4. The solids handling equipment rotary plough as claimed in claim 2 or claim 3, in which the connector portion of one of the first and second parts or components defines a joint seat to receive and seat a joint portion of the connector portion of the other of the second and first parts or components, the joint seat and the joint portion being configured such that they lock the first part or component and the second part or component together, preventing relative rotation between the first part or component and the second part or component about a fastener joining together the first part or component and the second part or component.

5. The solids handling equipment rotary plough as claimed in any of claims 1 to 4, in which the mounting means includes or is in the form of at least one mounting aperture extending through the connector between the top and the bottom of the metal body.

6. The solids handling equipment rotary plough as claimed in claim 5, in which the mounting means includes or is in the form of at least two spaced mounting apertures, the mounting apertures being positioned and spaced to fall on an arc of a single segment of an imaginary circle, where the imaginary circle has a diameter of between 2000mm and 4000 mm, or between 4000mm and 5000mm.

7. The solids handling equipment rotary plough as claimed in any of claims 1 to 6, in which the connector defines a projection that projects towards said first ends of the elongate faces so that, in use, said projection can be received in a recess or notch or serration or gouge in a periphery of a rotatable grate component to which the solids handling equipment rotary plough is mounted.

8. A solids handling equipment rotary plough part or component, the rotary plough part or component including

a metal body having a bottom and a top, and defining an elongate face extending between the bottom and the top and from a first end to a second end of the elongate face; and

a connector extending away from said elongate face to connect and join the plough part or component to another plough part or component which also has an elongate face to provide a rotary plough with opposed elongate faces that face away from each other,

the first end and the second end of said elongate face being spaced further from each other than the top and the bottom are spaced from each other providing the elongate face with a length greater than a height, the elongate face having at least two elongate major surfaces which are not co-planar, an upper, elongate, non-vertical, major surface being angled towards the connector at an angle of at least 1° to the vertical and a lower, elongate, vertical, major surface, an angle between the lower, elongate, vertical, major surface and the upper, elongate, non-vertical, major surface thus being greater than 180°,

the connector being at a substantially right angle to the lower, elongate, vertical, major surface where said angle is taken in a vertical plane perpendicular to the lower, elongate, vertical, major surface and the connector defining mounting means to mount the rotary plough part or component to a rotatable grate component.

9. The solids handling equipment rotary plough part or component as claimed in claim 8, in which the connector includes or defines joining means to connect and join the plough part or component to said another plough part or component which also has an elongate face to provide a solids handling equipment rotary plough with opposed elongate non-parallel faces that face away from each other.

10. The solids handling equipment rotary plough part or component as claimed in claim 8 or claim 9, in which the connector defines a projection that projects towards said first ends of the elongate face so that, in use, said projection can be received in a recess or notch or serration or gouge in a periphery of a rotatable grate component to which the solids handling equipment rotary plough component or part is mounted.

11. The solids handling equipment rotary plough part or component as claimed in any of claims 8 to 10, in which a periphery of the connector on a side of the connector facing towards said first end of said elongate face defines a formation to receive a complementary projection of a rotatable grate component to which the solids handling equipment rotary plough is to be mounted in use.

12. A rotatable grate assembly for a gasifier for gasifying carbonaceous material producing ash, the rotatable grate assembly including

a rotary component configured to rotate about a vertical axis of rotation in at least one direction; and

a plurality of rotary ploughs mounted to the rotary component to rotate together with the rotary component in a horizontal plane about said axis of rotation to describe a circle,

at least one of the rotary ploughs including

a metal body having a bottom and a top, and defining a pair of opposed spaced non-parallel elongate faces extending between the bottom and the top and from a first end to a second end of each opposed elongate face, the first end and the second end being spaced further from each other than the top and the bottom are spaced from each other providing each opposed elongate face with a length greater than a height, the opposed elongate faces being on opposite sides and facing away from a first imaginary vertical plane, each of said opposed elongate faces having at least two elongate major surfaces which are not co-planar, an upper, elongate, non-vertical, major surface being angled towards the first imaginary vertical plane to slope upwardly towards said first imaginary vertical plane at an angle of at least 1° to the vertical and a lower, elongate, vertical, major surface which is angled in a horizontal plane at an angle of at least 2° relative to the lower, elongate, vertical, major surface of the other of the opposed elongate faces so that the first ends of the opposed elongate faces are closer to each other than the second ends of the opposed elongate faces are to each other, the first end of each elongate face being on a common side of a second imaginary vertical plane which is perpendicular to the first imaginary vertical plane and which is thus located between the first end and the second end of each elongate face, the opposed spaced non-parallel elongate faces being joined by a connector defining mounting means mounting the

rotary plough to said rotary component, said mounting means being located between said opposed non-parallel elongate faces.

13. The rotatable grate assembly as claimed in claim 12, in which the first imaginary vertical plane coincides with a radius of said circle described by the rotary ploughs mounted to the rotary component.

14. The rotatable grate assembly as claimed in claim 12 or claim 13, in which said first ends of the opposed elongate faces are closer to the axis of rotation of the rotary component than said second ends, and closer to each other than the second ends are to each other so that, with said at least one rotary plough being mounted to the rotary component to extend radially away from the axis of rotation, the rotary plough is in plan view widening in a radial direction away from the axis of rotation.

15. A gasifier for gasifying carbonaceous material, the gasifier including a rotatable grate assembly as claimed in any of claims 12 to 14, the rotatable grate assembly being mounted within a gasification chamber defined by a gasification vessel.

16. Use of the gasifier as claimed in claim 15 to gasify coal, waste or biomass, or a combination of two or more of coal, waste and biomass.

17. The use as claimed in claim 16, in which the gasifier is used to gasify coal at a pressure of between 5 bar(g) and 100 bar(g) and at a temperature of between 400°C and 1600°C.

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