Claims

Claim 1

A plastic material vaporizing device, comprising:

a container having a cylindrical portion at an upper part thereof and an inverted cone portion or inverted truncated cone portion at a lower part thereof;

a shaft extending from the upper part to the lower part in the container; and

four stirring blades which rotate around the shaft,

the four stirring blades being divided into two sets, a first set and a second set, with each set including two stirring blades, and provided along a plane passing the shaft, the two stirring blades in each of the two sets extending in a direction opposite to each other from the shaft at a center, the first set of the two sets of the stirring blades being connected to the shaft at a position closer to a lower end of the shaft than a position where the second set of the two sets of the stirring blades are connected to the shaft,

the two stirring blades in each of the first set and the second set being arranged such that:

(a) the two stirring blades of each of the first set and the second set have a curved convex surface and a curved concave surface, the curved concave surface of each of the stirring blades facing toward the shaft at the center and in a direction opposite to a direction in which the curved convex surface of each corresponding stirring blades faces, the curved concave surface of each of the two stirring blades of each set facing forward in rotation of the stirring blades; and

(b) with regard to respective cross sections of the two stirring blades of each set, the two stirring blades of each of the first set and the second set have a semi-circular cross section, at least one of the two stirring blades has a flat surface facing forward in a direction corresponding to rotation of the stirring blades around the shaft at the center, the flat surface corresponding to a flat portion of the semi-circular cross section, and at least one of the two stirring blades has an arc of the semi-circular cross section, which arc faces the upper part of the container.

Claim 2

A plastic material vaporizing device as set forth in claim 1, further comprising:

an inlet at a top panel of the cylindrical portion, the inlet having an inverted truncated cone shape,

the inlet being provided with a resistive heating section on an outer wall surface of the inlet, the outer wall surface lying along a direction of an axis of the inverted truncated cone shape.

Claim 3

A plastic material vaporizing device as set forth in claim 1 or 2, further comprising:

a furnace which externally heats the inverted cone portion or inverted truncated cone portion; and

a flow channel connected to a second container.

Claim 4

A plastic material vaporizing device as set forth in any one of claims 1 to 3, further comprising:

a cylindrical joint having an octagonal inner surface; and

a drive shaft transmitting power to the cylindrical joint by axial rotation thereof,

the shaft and the drive shaft each having an octagonal prism shape, the shaft having (i) an upper end portion inserted into the cylindrical joint from below the cylindrical joint and (ii) the drive shaft being inserted into the cylindrical joint from above the cylindrical joint, the drive shaft having a lower end portion which has an inverted octagonal pyramid shape or inverted octagonal truncated pyramid shape.

Claim 5

An apparatus for extracting a hydrocarbon compound from a plastic material, comprising:

a plastic material vaporizing device as recited in any one of claims 1 to 4;

a primary cooling tank;

a secondary cooling tank;

an inlet at a top panel of the cylindrical portion, the inlet having an inverted truncated cone shape; and

a resistive heating section provided, on an outer wall surface of the inlet, the outer wall surface lying along a direction of an axis of the inverted truncated cone shape,

(1) the container being connected to the primary cooling tank via a flow channel, and (2) the primary cooling tank being connected to the secondary cooling tank via another flow channel.

Claim 6

The apparatus as set forth in claim 5, wherein:

the primary cooling tank includes a heating section.

Claim 7

The apparatus as set forth in claim 5 or 6, wherein:

the secondary cooling tank is cooled by a cooling medium.

Claim 8

A method of extracting a hydrocarbon compound from a

plastic material by use of the apparatus as set forth in claim 5, comprising the steps of:

introducing the plastic material into the inlet;

fluidizing part of the plastic material by heating the inlet;

vaporizing the hydrocarbon compound contained in the plastic material in the container, by (a) heating the plastic material which has been fluidized, concurrently with (b) stirring the plastic material by use of the stirring blades; and

transferring the hydrocarbon compound vaporized, to the primary cooling tank and the secondary cooling tank which are kept at a temperature lower than the container.