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APPARATUS FOR ATOMIZING MOLTEN SOLIDS

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FIG. 1

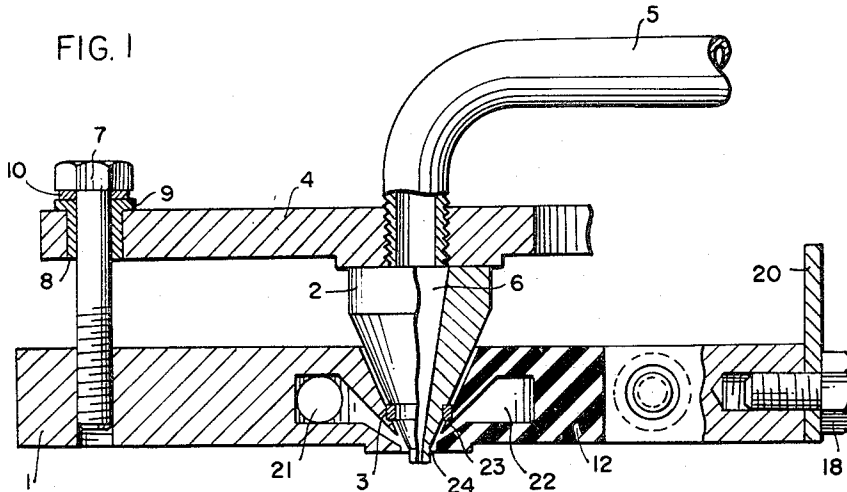


FIG. 2

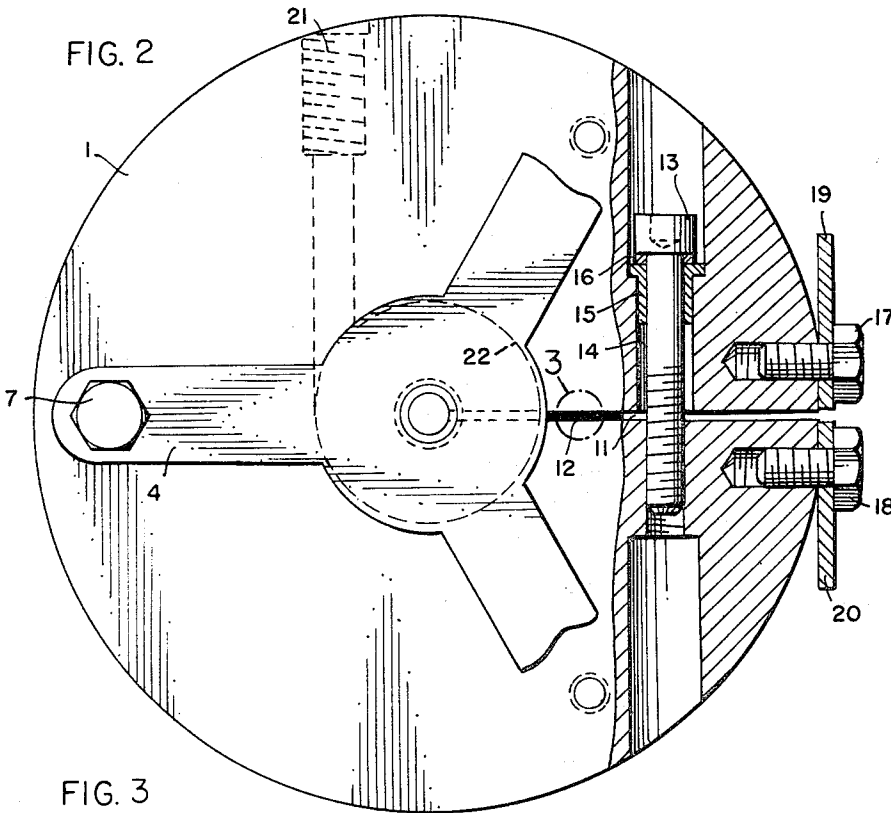
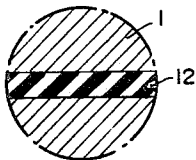


FIG. 3



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APPARATUS FOR ATOMIZING MOLTEN SOLIDS
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2 Claims. (Cl. 239-81)

ABSTRACT OF THE DISCLOSURE

Apparatus for atomizing a liquid such as a molten salt or metal by means of compressed gas, consisting of a disk-shaped nozzle casing and a nozzle member pressed onto the casing by means of a support. Spacer ring insulates the nozzle casing from the nozzle member. Nozzle casing is provided with a radial slit and constructed as an induction coil. Electric high-frequency current is supplied to the nozzle casing to heat the nozzle member by induction.

This invention relates to a method of atomizing liquids and particularly to a method of atomizing liquids at very high temperatures, for example molten salts or molten metals. The invention also relates to apparatus suitable for carrying out the method.

It is known that liquid substances may be atomized by means of a gaseous or vaporous pressure medium.

It is also known that the nozzle member located in the path of discharge of the liquid substance may be heated. This heating may be gas heating, electrical heating or electrical induction heating, the latter type of heating being very effective. It is a disadvantage of the said prior part types of heating that it is impossible to heat the nozzle member uniformly over its whole length and particularly the tip of the nozzle member cannot be heated.

It is an object of the present invention to provide a method of atomizing liquids which does not have the disadvantages of the prior art methods, above all those disadvantages associated with the heating of the nozzle, and which therefore may be used for atomization of liquid (molten) salts or metals at high temperature. It is a further object of the invention to provide apparatus for carrying out the said method.

According to this invention, in a method in which a liquid is atomized by means of compressed gas in a nozzle comprising an inner nozzle chamber, an adjacent outer nozzle chamber, an inner wall separating the two chambers and an outer wall surrounding the outer nozzle chamber, the inner wall is heated electrically by induction, the cold compressed gas is supplied to the outer nozzle chamber, is heated therein while at the same time cooling the outer wall and is ejected through the lower opening of the outer nozzle chamber to atomize the liquid, the liquid being supplied at the same time to the lower opening of the inner nozzle chamber and being atomized here by the heated compressed gas as it issues.

The compressed gas has a twisting motion imparted to it in the outer nozzle chamber.

Apparatus for atomizing liquids according to this invention comprises heat insulation between the nozzle member forming the inner wall and the outer nozzle casing forming the outer wall and the arrangement of the nozzle casing as an induction coil in a high frequency circuit.

The nozzle member is formed as a double cone in the direction of the opening of the inner nozzle chamber and ends in an apex.

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The method according to this invention makes it possible to heat the entire nozzle member, above all its apex, to temperatures up to about 1600° C. For this purpose the nozzle casing is made of a substance having good thermal conductivity, for example copper, and it is connected to a source of high frequency current in such a way that it acts as an induction coil.

The way in which the compressed gas flowing through the nozzle is directed through the outer nozzle chamber ensures that the gas serves not only to atomize the liquid but also to cool the nozzle casing constituting the induction coil.

The nozzle member is heated inductively. A heat-proof insulation ring of aluminum oxide or magnesium oxide ensures the spacing of the nozzle member by about 1 to 2 mm. from the induction coil or nozzle casing. The field line density is very high at the apex of the nozzle member. The maximum temperature is therefore reached at the apex, and this is important in atomizing salts or metals having a high melting point.

Apparatus suitable for carrying out the method according to this invention is shown by way of example in the accompanying drawings in which FIGURE 1 is a cross-section through the apparatus and FIGURE 2 is a top plan view of the apparatus partly in section with the portion enclosed within the circle 3 of FIG. 2 shown on a larger scale in FIG. 3.

The apparatus comprises a nozzle casing 1 which at the same time constitutes an induction coil. A nozzle member 2 is located in the nozzle casing 1. The nozzle member 2 is centered and insulated by means of a spacer ring 3 and is pressed onto the nozzle casing 1 by a support 4. A supply pipe 5 is mounted centrally in the support 4 for the supply of the liquid to be atomized. The supply pipe 5 opens into a passage 6 in the nozzle member. The support 4 is pressed onto the nozzle casing by screws 7. To insulate the support 4 from the nozzle casing 1, liners 9 are provided in the holes 8 in the support 4, and a washer 10 is provided on top of each of the liners 9 to distribute the pressure of the screws.

The nozzle casing 1 is provided with a cut 11 extending over half the diameter of the casing. A packing 12 is located in the cut 11 to insulate the two portions of the nozzle casing 1. The two portions are pressed together by a screw 13. A liner 15 with a washer 16 is provided in a hole 14 to insulate the screw from the casing 1. Electric current is supplied through screws 17, 18 and terminals 19, 20 arranged on either side of the cut 11. The medium for atomizing the liquid flows through a bore 21 in the nozzle casing 1 into a cavity 22 in a tangential direction and leaves the cavity 22 through a double conical gap 23 and a gap 24 between the nozzle casing 1 and the nozzle member 2.

Owing to the favorable adaptation of the high frequency generator to the nozzle casing constructed as an induction coil, and owing to the inductive heating of the nozzle member, it is possible without difficulty to heat the entire nozzle casing to a temperature of about 1600° C. It is therefore possible to atomize metals or salts having high melting points in a simple way.

We claim:

1. Apparatus for atomizing a liquid such as a molten salt or molten metal by means of compressed gas comprising a disk-shaped nozzle casing having a cavity with a nozzle opening, a nozzle member mounted in said cavity with its nozzle tip in said opening, an insulating spacer ring between the nozzle casing and the nozzle member, said casing having a radial slit therethrough, an insulating packing in said slit, said nozzle casing having an annular cavity about said nozzle member for the supply of said gas to said opening about said nozzle tip, terminals on

said casing for the supply of high-frequency electric current to the nozzle casing, which functions as an induction coil, said nozzle member thereby being electrically heated by induction, and a tube means connected to said nozzle member for the supply of the liquid to be atomized. 5

2. Apparatus for atomizing a liquid such as a molten salt or molten metal by means of compressed gas comprising a disk-shaped nozzle casing having therein a central, conical, axial cavity with a nozzle opening, a nozzle member having a conical segment in said cavity with its nozzle tip in said opening, an insulating spacer ring between the nozzle casing and the wall of said cavity, said casing having a radial slit therethrough, an insulating packing in said slit, said nozzle casing having an annular cavity about said nozzle member for the supply of said gas to said opening about said nozzle tip, terminals on said casing for said nozzle member for the supply of

high-frequency electric current to the nozzle casing, which functions as an induction coil, said nozzle member thereby being electrically heated by induction, and tube means connected to said nozzle member for the supply of the liquid to be atomized.

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