

- [54] **NOZZLE FOR ROTARY KILN**
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 Arthur M. Streich

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 239/568, 239/600
 [51] **Int. Cl.**..... **B05b 3/00**, B05b 15/10
 [58] **Field of Search**..... 239/276, 280, 600,
 239/587, 208, 280.5, 281, 282, 283

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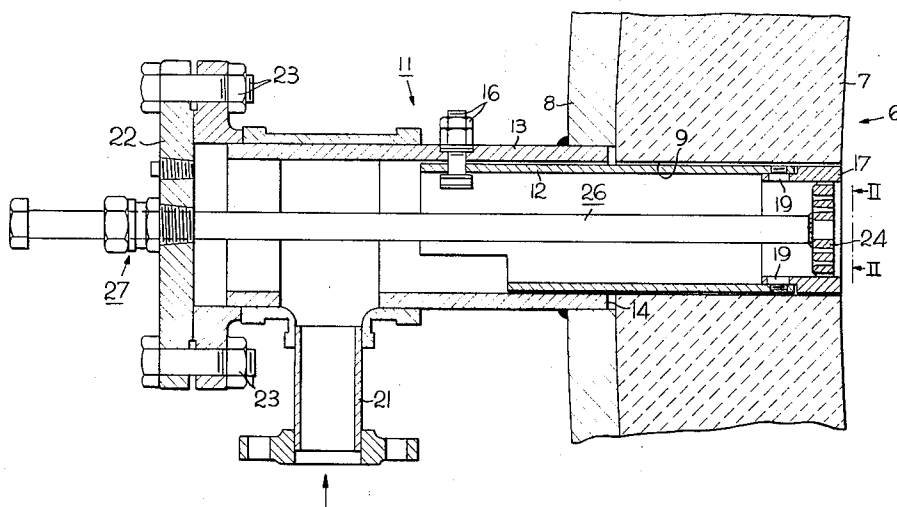
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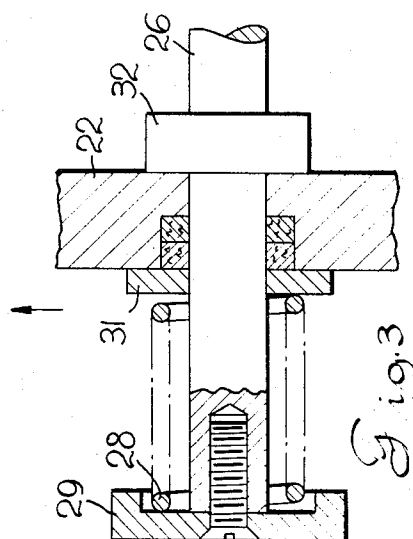
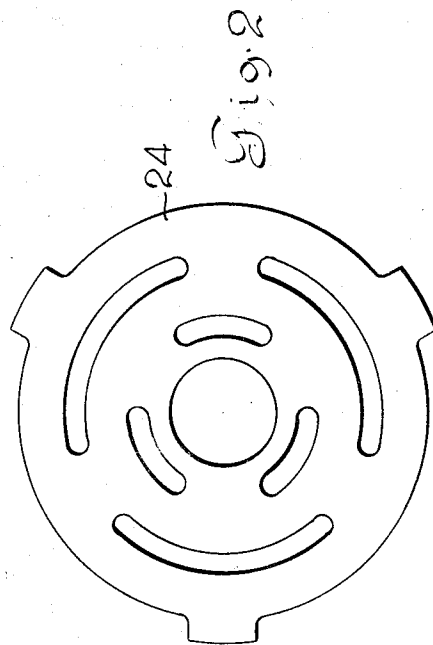
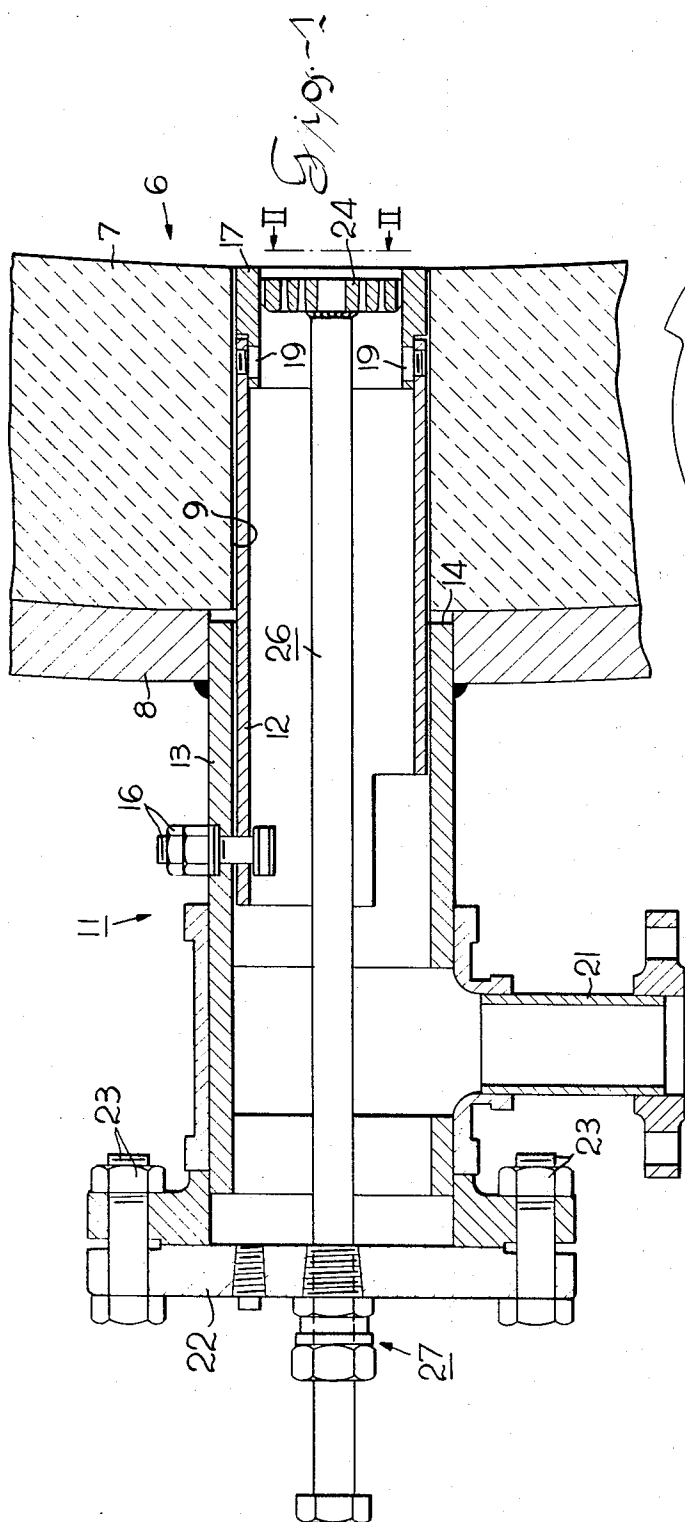
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[57] **ABSTRACT**

A nozzle connected to a kiln for supplying fluid thereto wherein the nozzle orifice plate is supported by an elongated rod extending through the nozzle body to the exterior thereof. The exterior end of the support rod can be manipulated to cause movement of the orifice plate relative to the nozzle body and thereby prohibit material buildup at the inner end of the nozzle.

3 Claims, 3 Drawing Figures





NOZZLE FOR ROTARY KILN

This invention relates to rotary kilns, used for such purposes as reducing iron ore to a lower state of oxidation and having nozzles mounted on the outer surface of the kiln and projecting radially through the kiln shell to inject fluid into the kiln at circumferentially and axially spaced locations along the length of the shell. Particularly the present invention pertains to an improved and simplified nozzle for such a rotary kiln.

The nozzles in a rotatable kiln alternately pass beneath and above the ore charge. The hot charge of or may in some instances adhere to the inner end of the nozzles. This causes the nozzle inner end to become clogged resulting in a reduced amount of fluid entering the kiln. Because of this it is sometimes necessary to remove the nozzles and clean them of any material that has adhered to the interior end thereof.

In some of the larger kilns there are as many as 180 nozzles provided about the surface of the kiln. It can be readily seen that it would be completely impractical to disconnect the nozzles from the fluid piping and remove them from the kiln in order to clean them. For this reason nozzles have been designed with shields across the nozzle openings into the kiln to protect the nozzle from the material being reduced. Furthermore, nozzles have been provided with the openings into the kiln disposed in a direction opposite to the direction from which the material initially strikes the nozzle as the kiln is rotated. Such a nozzle is disclosed in U.S. Pat. No. 2,091,850 issued to K. R. Gohre August 31, 1937. These nozzles have not however been completely successful because eventually the material does adhere to them causing a reduction in the gas or air flow resulting in the requirement for removal and cleaning.

It is applicant's intention and the general object of this invention to provide a nozzle for a rotary kiln which can be cleaned of material adhering thereto without removing the nozzle from the kiln.

A further object of the subject invention is to provide a nozzle of the hereinbefore described type wherein a nozzle orifice plate is supported by a rod extending to the exterior of the nozzle which can be manipulated to cause the plate to move relative to the nozzle body and thereby clean any material adhering to the inner end of the nozzle.

A more specific object of the subject invention is to provide a nozzle of the hereinbefore described type wherein the body of the nozzle is composed of two sections, the outer section being connected to the relatively cool outer shell of the kiln and the inner section, which is exposed to the heat on the interior of the kiln, telescopically connected to the outer section in a manner which permits removal and replacement of the inner section without removing the outer section of the nozzle body.

These and other objects of the subject invention will become more fully apparent as the following description is read in light of the attached drawing wherein:

FIG. 1 shows a side view in cross-section of a nozzle constructed in accordance with this invention;

FIG. 2 is a view taken in the direction of the arrows II--II in FIG. 1; and FIG. 3 shows a modified means of connecting the support rod to the nozzle.

Referring now to the drawings, a portion of a kiln generally designated 6 is shown composed of an inner lining or wall 7 constructed of any suitable refractory

material such as firebrick defining a combustion chamber and an outer wall or shell 8 usually constructed of metal. A plurality of openings 9 are provided through the kiln walls to the combustion chamber. These openings are circumferentially and axially spaced about the surface of the kiln and receive nozzles 11 for delivery of fluid into the combustion chamber.

The nozzle of this invention generally designated 11 is composed of inner and outer body sections 12 and 13 respectively. The outer or first body section 13 is supported by the outer shell 8 in any conventional manner such as by welding. The inner end 14 of the outer section 13 is shielded from the high temperature at the interior of the kiln by means of the refractory material 7.

The inner or second body section 12 of the nozzle is telescopically received in the outer body section 13 and extends through the opening 9 to the interior of the kiln. Means such as the nut and bolt 16 are provided to releasably attach the two body sections together. Furthermore an end wear piece 17 may be connected to the inner end of the inner body section 12. This inner end piece may be removably attached to the inner body section in any conventional manner such as by the screws 19. With this arrangement if the inner end piece becomes worn due to abrasive action of the charge, only the inner end piece 17 will have to be replaced.

The outer body section 13 of the nozzle is provided with an inlet port 21. This inlet port is provided with a conventional flange for connection to the air or fuel inlet line depending on the particular use of the nozzle. The exterior end of the outer body section 13 has a flange thereon to which is connected a closure member 22 in any conventional manner such as by the bolts and nuts 23.

An orifice plate 24 herein shown for purposes of illustration as having the configuration and openings therethrough as shown in FIG. 2 is slidably contained within the inner body section 12. This orifice plate 24 is positioned closely adjacent to the interior of the kiln and is constructed and arranged to permit both longitudinal and rotary movement thereof relative to the end wear piece 17. It should be understood that if the wear resistant piece 17 is not utilized the orifice plate 24 would be constructed and arranged to move relative to the inner body section 12 of the nozzle.

A support rod 26 has one end thereof connected to the orifice plate 24. The rod extends completely through the nozzle and an opening provided through the closure 22 terminating on the exterior of the nozzle. A pressure fitting generally designated 27 may be provided about the rod 26 and attached to the closure 22. This pressure fitting when turned in one direction clamps and holds the rod rigidly in place and when turned in the opposite direction permits both reciprocating and rotary movement of the rod relative to the closure 22.

A modified means of attaching the rod 26 to the closure 22 is shown in FIG. 3. Resilient means in the form of a coil spring 28 may be provided between the exterior end of the rod 26 and the closure 22. This spring may be attached in any conventional manner and is herein shown encircling the rod 26 and positioned between a saddle 29 connected to the end of the rod 26 and a washer 31, engaging the closure 22. A shoulder 32 is provided on the rod 26 for engagement with the inner surface of closure 22 where the rod is in the normal position.

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From the above description it can be seen that a very simplified reliable nozzle is disclosed. The inner body section 12 can be removed and replaced without requiring the removal of the outer body section 13 or disconnection of the inlet port from the fluid line. This is accomplished by removing the closure 22 and the rod 26 and orifice plate 24. The inner body section 12 can then be removed through the outer body section after the nut and bolt 16 is removed. It should be noted that it is also possible to knock the inner body section into the kiln if outward removal is impossible.

Furthermore the inner end of the nozzle and the orifice plate 24 can be kept clean by a periodic manipulation of the rod 26. The pressure fitting 27 is loosened and the outer end can be rotated or moved back and forth to clean the nozzle. With the arrangement of the rod shown in FIG. 3 a sharp blow can be delivered to the rod causing the rod and orifice plate to vibrate and move relative to the inner body section shaking loose any material adhering thereto.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A nozzle for supplying fluid to a kiln having an inner wall defining the combustion chamber and a spaced outer wall comprising:

an elongated hollow nozzle body having a first section with the inner end thereof connected to said outer wall and a second section connected to said

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first section and having an inner end opening to said combustion chamber, said first and second nozzle body sections being constructed and arranged to permit removal of said second section without removal of said first section from said outer wall;

a fluid inlet port to said first section of said body; plate means positioned in said body adjacent said second body section inner end, said plate means providing an orifice for the flow of fluid into said combustion chamber; and

an elongated rod extending through said nozzle body having one end attached to and supporting said plate means, the other end of said rod extending to the exterior of said nozzle body whereby movement of said rod causes movement of said plate means, said rod and said plate means being constructed and arranged to permit removal thereof without the removal of either body section.

2. The nozzle set forth in claim 1 wherein the inner end of said second body section is a cylindrical wear piece removably connected to said second body section.

3. The nozzle set forth in claim 1 and further comprising resilient means engaging said rod whereby said other end of said rod may be hammered causing said plate to vibrate.

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