United States Patent [19]

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[11] **3,781,002**

[45] **Dec. 25, 1973**

[54] **DUAL COAXIAL TUYERES**

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[22] Filed: **Nov. 17, 1972**

[21] Appl. No.: **307,697**

[30] **Foreign Application Priority Data**

Nov. 18, 1971 Belgium 775,527

[52] **U.S. Cl.** **266/41,** 75/60

[51] **Int. Cl.** **C21c 5/48**

[58] **Field of Search** ..... 266/34 L, 35, 36 P, 266/41; 75/59, 60

[56] **References Cited**

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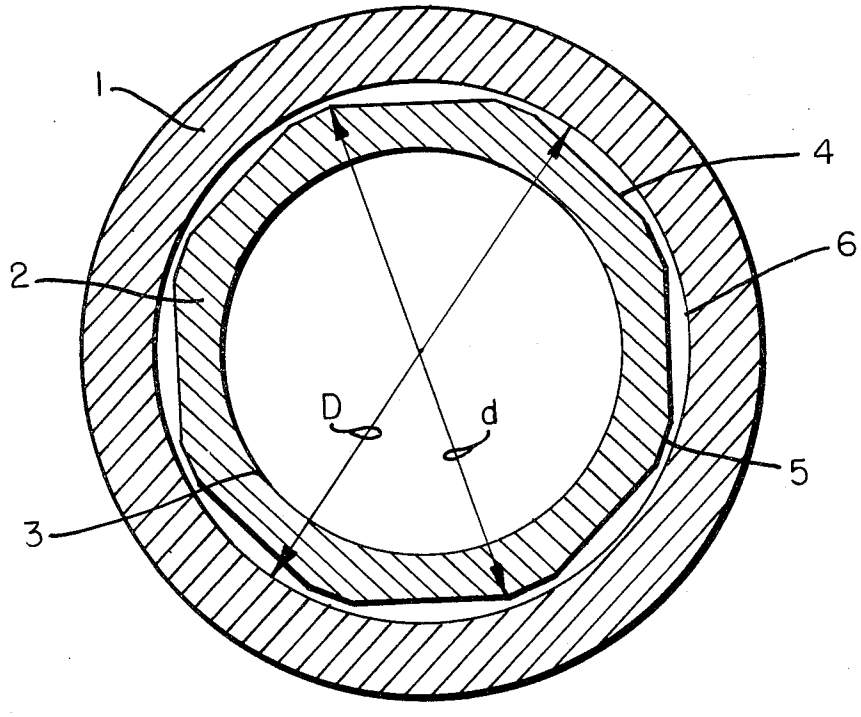
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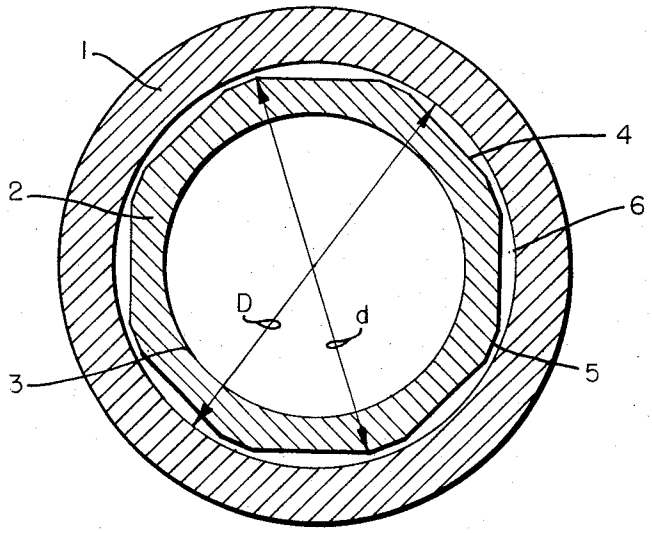
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[57] **ABSTRACT**

A dual coaxial duct tuyere for blowing oxygen and a protective fluid through the bottom of a metallurgical convertor, the outer duct being of a cylindrical shape and of dimensions adapted to receive the inner duct which has a circular passage coaxial with the outer cylinder and an external configuration comprised of at least six straight sides connected to each other by short arcuate sections, the length of each arcuate section being less than one-third the length of the straight sides.

6 Claims, 1 Drawing Figure




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DUAL COAXIAL TUYERES

This invention relates to dual, coaxial duct-tuyeres particularly useful in the blowing of oxygen through the bottom of a metallurgical convertor.

It is known that in pneumatic refining of pig iron by blowing through the bottom of a convertor pure oxygen cannot be used because of the corrosion suffered by the refractory lining surrounding the tuyeres at the bottom of the convertor.

In order to overcome this drawback, it has been proposed that tuyeres consisting of two coaxial ducts be used and that oxygen be blown-in through the central duct while a protecting fluid, gaseous or liquid, preferably one reacting endothermally, be blown in through the peripheral duct. Results obtained with such tuyeres have been of practical interest and the refractory lining surrounding these tuyeres did perform well, so that there was an increase in the life of convertor bottoms so equipped. Such tuyeres are described, for example in French Pat. No. 1,450,718; British Specification No. 1,253,581 and in U.S. Pat. application Ser. No. 800,892, filed Feb. 20, 1969.

However, the use of these dual-duct tuyeres does entail some difficulties mainly due (1) to the required precise positioning of the two ducts with respect to each other and (2) to the requirement that the respective dimensions of the ducts satisfy the pressure and flow-rate conditions of the fluids introduced into the convertor, especially if one of those fluids is a liquid hydrocarbon.

The usual construction of the converter bottom includes fastening the outer tuyere ducts on the bottom plate, tamping the refractory lining and baking the assembly at a temperature of the order of 800°C. Following this heating and cooling, the tuyeres are completed by sliding the central duct inside each outer duct. Introduction of the central tube may be rendered difficult and even impossible if said outer duct has buckled as a result of being subjected to the high firing temperatures. Even slight dislocation of the ducts from precise coaxiality should be avoided because an effective protective effect requires distribution of the peripheral fluid essentially evenly along the outer periphery of the inner tube.

Furthermore, the dimensions of the two ducts must be suitable for the desired fluid flow-rates while at the same time permitting the flow-rates to be maintained in a ratio determined by the particular circmustances, and this requires a selection regarding the area between the outer wall of the central conduit and the inner wall of the outer conduit. In addition the selection of the dimensions of the two ducts (diameters and thicknesses) requires taking into account peripheric fluid pressure, and in case the fluid is a liquid hydrocarbon, the clearance between the two ducts normally must be fairly small, while still sufficient to permit proper fluid flow-rate.

The principal object of the present invention is to provide a tuyere which avoids the difficulties exhibited by prior tuyeres.

The dual, coaxial duct tuyere of the present invention is characterized in that the outer contour of the inner duct cross-section comprises at least six appreciably chord-like straight (linear)sides which are uniformly arranged along the periphery of said cross-section, each of said appreciably rectilinear segments being

linked to the next adjacent segment by an arc of a length much less than the lengths of the substantially linear segment, and in that the configuration of said arcs is such as to fit into the inner contour of said peripheral duct with only the clearance required to avoid undue friction when the inner duct is inserted into the peripheral one.

According to an advantageous variation of the tuyere which is the object of the invention, the outer contour of the cross-section of the tuyere inner duct comprises eight essentially straight line chord segments; preferably the ratio of the length of each of said chords to the lengths of the arcs connecting chords is larger than two:one.

The coaxial ducts of the tuyere which is the object of the invention may be of any homologuous shapes, but ease of fabrication favors using ducts of circular cross-sections.

The FIGURE shows a purely illustrative example of the cross-section of one tuyere according to the present invention. This tuyere comprises a peripheral cylinder or duct **1** which is to be fastened in the bottom plate of the convertor; and an inner duct **2** which is provided with an inner wall **3** of circular cross-section while its outer wall comprises eight rectilinear segments **4** connected by arcs **5**, the lengths of each of the segments **4** being about three times the length of each of the arcs **5**. Diameter D of the inner contour of the peripheral duct **1** is slightly larger than diameter d of an envelope-circle containing area **5**, so that the inner duct **2** may be easily inserted into the peripheral duct **1** and may be kept in place because arcs **5** practically touch the inner wall **6** of said peripheral duct **1**.

According to the invention, the outer duct is advantageously constituted of a stainless steel or refractory steel tube.

Also according to the invention, the inner duct is advantageously constituted of a copper tube and particularly of an annealed copper tube, whereby the inner duct is sufficiently malleable to be inserted into the peripheral duct even if the outer duct has suffered a deformation during baking of the convertor bottom.

The dual, coaxial duct tuyeres which are the subject of the invention may easily be fabricated by machining the outer wall of the inner duct; there are no difficulties as regards putting one duct inside the other, particularly if an annealed copper tube is used as the inner duct.

The peripheral fluid supply is characterized by evenness and it has been observed that when this fluid is a liquid hydrocarbon, pressure and flow-rate conditions for said fuel-oil were satisfactory with tuyeres according to the present invention.

I claim:

1. A dual, coaxial duct tuyere, particularly for use in metallurgical convertors, comprising an outer duct and an inner duct coaxial therewith, the outer contour of the inner duct cross-section comprising at least six substantially rectilinear segments uniformly arrayed along the periphery of said cross-section, said segments in succession being connected to each other by arcs of a length less than the lengths of said substantially rectilinear segments on either side of said arcs, the geometric envelope of said arcs being such that it may fit into the inner contour of said peripheral duct within the clearance required for inserting the inner duct into the outer duct without undue friction.

2. A tuyere according to claim 1, thus characterized that the outer contour of the inner duct cross-section comprises eight substantially rectilinear segments connected to each other by arcs joining the end of one segment to an end of a succeeding segment.

3. A tuyere according to claim 1, wherein the ratio of the length of each segment to the length of each arc exceeds two.

4. A tuyere according to claim 1, wherein the outer duct is made of a stainless or refractory steel tube.

5. A tuyere according to claim 1, wherein the inner duct is made of a copper tube and preferably of annealed copper.

6. A convertor bottom provided with a plurality of tuyeres constructed according to claim 1.

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