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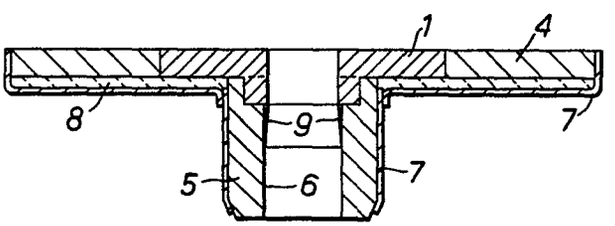
(54) Refractory components.

(57) A refractory component, notably an insert (1) for use in repaired (or prime) fixed or slidable plates in slide gate valves on steelplant vessels. The insert, which is preferably a pre-formed moulding, may be a flat plate of generally elliptical form having a circular bore therethrough or it may be T-shaped in side elevation comprising a parallel faced elongated head of elliptical form and a stem of circular section, the circular bore extending through the component co-axial with the stem.



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Refractory Components.

This invention relates to refractory components and more particularly relates to refractory inserts for use in fixed or slidable plates in vessel equipment commonly known as slide gate valves in metal melting casting shops.

Briefly, slide gate valves are teeming control mechanisms for use on ladles/tundishes and essentially comprise two apertured plates, one fixed and in line with an aperture in the bottom of the vessel and the other slidably mounted beneath the fixed plate, the metal being discharged when the two apertures are aligned with one another. The plates are made from a refractory material and each abut other refractory nozzles, an upper nozzle mounted above the stationary plate and a lower or collector nozzle mounted below the sliding plate.

In use the apertures (bores)are eroded by the hot metal and repairs are then effected to enable the components, particularly the more expensive fixed and sliding plates, to be re-used.

The use of pre-formed shapes inserted into used plates as a means of bore renovation is well known. Such inserts have been annular in cross-section, and have been fitted into a space produced by drilling out the worn section of the used plate around the original bore. In the case of the sliding plate such drilling normally extends beyond the plate itself into the collector nozzle below it, and the inserted cylinder is made to a height such that it extends from the newly formed surface in the body of the nozzle to the working face of the sliding plate. The surfaces between the base of the insert and nozzle, and between the vertical sides of the nozzle and the plate are bonded by a refractory cement.

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One disadvantage of such an arrangement is that vertical movement of the cylindrical insert can take place either during the use or during subsequent cooling of the system.

A second disadvantage is that the travel of the sliding plate during operation can frequently bring the cemented joint between the insert and plate across the bore in the stationary upper place, exposing the joint to molten metal, and thus promoting erosion.

A third disadvantage is that the wall thickness of the cylindrical insert is limited by the geometry of the sliding plate in some systems, thereby restricting the useful life of a repaired plate to the degree of bore erosion extending to the cemented joint.

It is an object of this invention to provide an improved refractory component to mitigate this problem.

From one aspect the present invention provides a pre-formed flat elongated refractory component of generally elliptical form having a circular bore therethrough.

Thus, with this invention, whereas the dimension of the insert at right angles to the 'long' axis can be restricted by the corresponding plate dimension the length of the insert can be such as to exceed the longitudinal movement of the mechanism, thus removing the cement joint out of the range of metal attack and eliminating the second and third disadvantages of the cylindrical insert. Moreover, because of the increased mass of insert, and its broad base, the chances of vertical movement are greatly reduced.

However, such a solution can leave a weak point in the assembly at the lower surface of the insert where it contacts the upper surface of the dependent collector nozzle. Given metal turbulence during operation, this horizontal avenue can provide a potential escape route for molten metal should the cemented joint be attacked or loosened.

Thus, from a second aspect, the present invention provides a pre-formed unitary refractory component, T-shaped in side elevation and comprising a parallel-faced elongated head and a stem of circular section, a circular bore extending through the component co-axial with the stem.

Preferably the elongated head defines a generally elliptical form in plan view, thus obviating the previous disadvantages referred to .

From another aspect the present invention also provides a refractory component comprising a parallel faced elongated plate, a circular section apertured nozzle mounted on one side thereof and a flat insert according to the first aspect of this invention lying within the plate, the bore being in alignment with the nozzle aperture.

From yet another aspect the present invention also provides a refractory component comprising a parallel faced elongated plate, a circular section apertured nozzle mounted on one side thereof and a unitary T-shaped insert according to the second aspect of this invention in which the head thereof lies within the plate and the stem protrudes within the end of the nozzle, the bore being in alignment with the nozzle aperture.

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The major portion of the outer periphery of the component, other than the plain face on the other side of the plate, may be bounded by a metal casing, the whole forming a sliding plate/collector nozzle unit.

In accordance with the second aspect of this invention the advantages of both the elongated and circular inserts may be realised, in particular, the function of the elongated head is that of the flat elongated insert first recited while thecylindrical stem affords a secure attachment to the nozzle and introduces a step-shaped insert-to-nozzle contact which inhibits the escape of molten metal from the system.

Primarily, the insert would be used in repaired plates but it could alternatively be adopted in new or prime plates; after use the insert may readily be removed and a further one introduced thus avoiding the necessity for cutting and drilling.

The insert may not necessarily be pre-formed and the invention also comprises a modification of the various aspects referred to above in which the insert,either flat or T-shaped, is a monolithic refractory rammed in situ and cured.

In order that the invention may be fully understood, an embodiment thereof will now be described by way of example, with reference to the accompanying drawings, in which:

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Figure 1 shows a plan view of a plain generally elliptical insert according to one aspect of this invention.

Figures 2 and 3 show plan and side elevations, respectively, of a T-shaped insert according to another aspect of this invention, and

Figure 4 shows a side elevation of a sliding plate/collector nozzle component incorporating this latter insert.

Referring now to Figure 1 the insert comprises a moulded and fired refractory component of e.g. magnesia or high purity alumina, shaped so as to define a plain parallel-faced generally elliptical body having a bore centrally disposed therethrough.

Referring now to Figures 2 and 3 the alternative form of insert comprises a moulded and fired T-shaped refractory component of e.g. magnesia or high purity alumina, shaped so as to define a generally elliptical head portion 1 and a dependent circular section stem 2; a circular section bore 3 extends through this component.

Figure 4 shows the latter insert mounted in the sliding element of a slide gate valve comprising a generally elliptical parallel-sided plate 4 and a refractory collector nozzle 5 having a bore 6. These may be made from magnesite chrome. A metal casing 7 is provided around the bulk of this unit, and this may be bedded-in with a refractory cement 8.

In this example shown the insert is used as a repair in the sense that an elliptically shaped hollow is machined from the plate 4 to the dimension of the head portion 1 of the insert and a circular section hole is drilled in the upper portion of the nozzle 5 to the dimensions of the stem 2.

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The insert is then cemented into position as shown and the through bore is made up to a smooth contour by cement 9. The exposed upper face of the component is then ground to present a flat uniform surface.

A similar form of repair would be used for the plain insert of Figure 1 but in that instance only the plate 4 would be drilled out, the nozzle 5 being left in its original form (as depicted by the dotted lines - Fig.4.).

Whereas the above description relates to a fixed moulded insert the repair may equally well be effected by ramming a refractory cement into the T-shaped (or plain) hollow, a circular spigot being positioned in the central bore. A typical ramming mix which might be used may be alumina containing a chemical bonding agent such as phosphate, the cement then being cured at e.g. 350°C and the plate ground as before.

The insert may be replaced more than once, whether it be from a repair (as shown) or from a prime component incorporating an insert.

Although the invention has been described with reference to the particular embodiments illustrated, it is to be understood that various modifications may readily be made without departing from the scope of this invention. For example, the insert may be differently dimensioned and shaped consistent with the T-shaped concept and different materials may be utilised. In addition, the insert may be used for the repair of the fixed plates/upper nozzles in slide gate valves.

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CLAIMS

1. A refractory component for use in equipment in metal melt-holding vessels, characterised in that it comprises an insert of generally elliptical form (1) having a circular bore (3) therethrough.

2. A component according to claim 1, characterised in that the insert is T-shaped in side elevation, comprising a parallel-faced elongated head of elliptical form and a stem (2) of circular section, the circular bore extending through the component co-axial with the stem.

3. A refractory component comprising a parallel faced elongated plate (4) and a circular section apertured nozzle (5) mounted on one side thereof, characterised by an insert according to claim 1 lying within the plate, the bore being in alignment with the nozzle aperture.

4. A refractory component comprising a parallel faced elongated plate (4) and a circular section apertured nozzle (5) mounted on one side thereof, characterised by a unitary T-shaped insert according to claim 2 with the head thereof lying within the plate and the stem protruding into the end of the nozzle, the bore being in alignment with the nozzle aperture.

5. A refractory component according to claim 3 or claim 4, characterised in that the major portion of the outer periphery of the component, other than the plain face on the other side of the said plate, is bounded by a metal casing (7), the whole forming a sliding plate/collector nozzle unit of a slide gate valve.

6. A refractory component according to any one of claims 1 to 5, characterised in that the insert is a moulded and fired pre-formed item.

7. A refractory component according to any one of claims 3 to 5 characterised in that the insert is a monolithic refractory mix rammed in situ and cured.

8. A refractory component according to any one of claims 3 to 7, characterised in that the insert is utilised as a repair in the worn component.

FIG.1.

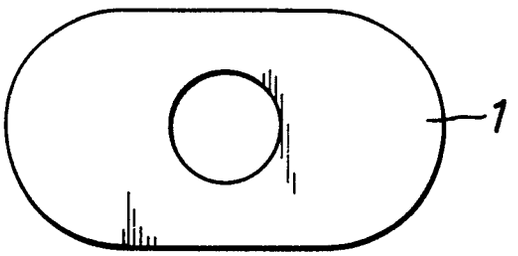


FIG.2.

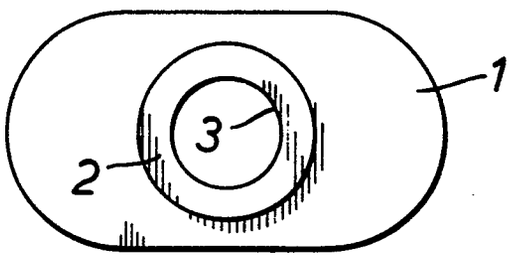


FIG.3.

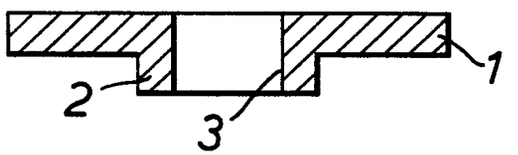
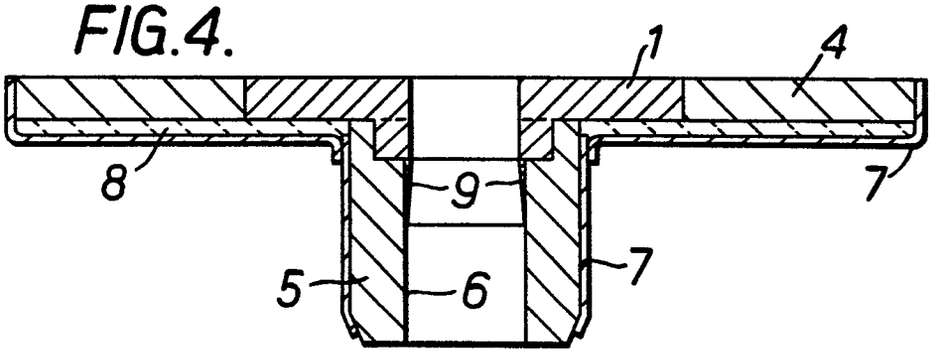


FIG.4.



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EUROPEAN SEARCH REPORT

Application number

EP 82 30 0846.1

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	DE - A1 - 2 820 685 (VYSOKA SKOLA CHEMICO TECHNOLOGICKA) * claim 1 * & FR - A1 - 2 390 229 & GB - A - 1 589 659	1
P,A	GB - A - 2 081 431 (FLOGATES LTD.) * claim 1; fig. 1, reference 3 *	1
A	DE - U - 7 908 300 (ZIMMERMANN & JANSEN GMBH) * claim 1 *	1,2
A	DE - U - 6 918 994 (J. & J. DYSON LTD.) * claim 1; fig. 1 to 4 *	1,2,6
A	DE - U - 1 889 105 (STOECKER & KUNZ) * claims 1, 4; fig. 1 *	1,7,8
A	US - A - 3 797 712 (KUTZER et al.) * claims 1 to 4; fig. 4 *	1,5,6

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

B 22 D 41/08

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

B 22 D 41/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same category
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Berlin	21-10-1982	GOLDSCHMIDT