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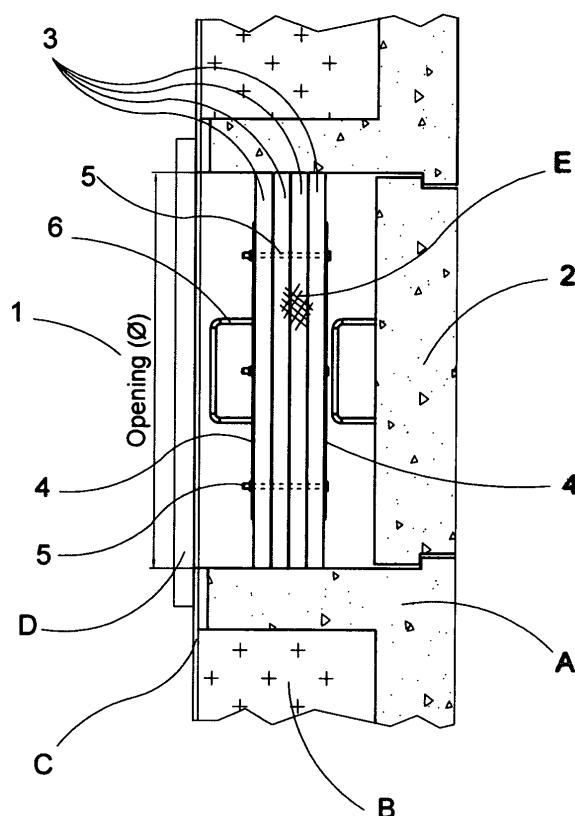
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(54) **Shield for preventing heat transfer**

(57) The present invention relates to providing a thermal radiation and conduction shield suitable for mounting on the rear side of a protective face block placed on an opening, such as a manhole, in the refractory ceramic lining of a boiler, furnace, or like apparatus. The shield is employed in said opening in order to prevent conduction of heat through the protective face block from the firebox to those frame constructions of the apparatus that are not manufactured from heat-resistant materials. Since the material of the protective face block is typically a refractory, high-density ceramic material of very high thermal conductivity, the operating temperature of the hot side of the shield is practically equal to that of the firebox. Consequently, the backing insulation of the shield must provide effective thermal insulation as well as good resistance to high temperatures. A third prerequisite is resistance to mechanical stress under practical operating conditions.

Fig 1



Description

[0001] It is an object of the present invention to provide a thermal radiation and conduction shield suitable for mounting on the rear side of a protective face block placed over an opening, such as a manhole, in the refractory ceramic lining of a boiler, furnace, or similar apparatus. The shield is employed in said openings in order to prevent conduction of heat through the protective face block from the firebox to those frame constructions of the apparatus that are not manufactured from heat-resistant materials. The internal temperature in these sections typically exceeds 800 °C, while the boiler frame construction materials may generally be subjected to a maximum temperature of about 100 to 150 °C. Since the protective face block is typically made of a refractory high-density ceramic material with very high thermal conductivity, the operating temperature of the hot side of the shield is practically equal to that of the firebox. Consequently, the backing insulation of the shield must provide effective thermal insulation as well as good resistance to high temperatures. A third prerequisite is resistance to mechanical stress under practical operating conditions. Namely, the shield is removed during any shut-down period, and even this repeated displacement on its own imposes stresses on the fragile shield. The opening covered by the shield may be round, oval or angular, for instance.

[0002] Conventionally, the construction of the above-described shields preventing radiation and conduction of heat is accomplished as follows: glass-fibre fabric is prepared into the shape of a pouch that has approximately the size and shape of the opening, and the pouch is stuffed with a ceramic fibre resistant to high temperatures. Subsequently, the pouch is closed by stitching in order to keep the fibre within. The bag formed in this fashion is then introduced into the opening in the lining behind the face block, and the door of the opening is secured in place.

[0003] Another method for implementing the shields is to manufacture them from an insulating heat-resistant castable by mould casting. The material is inelastic, and the shield is always designed to be smaller in its dimension than the opening, in order to ensure that it fits the opening.

[0004] A drawback of employing prior art technique is that the glass-fibre fabric and the knittings therein withstand the effects of high temperatures only for a short period of time. When the brittle bag is displaced during shut-downs, the knittings and the surface fabric in the bag break down and the, by nature, more heat-resistant ceramic fibre contained within is discharged from the bag. Therefore, this prior art solution has a short life-cycle. The materials, manufacture, and service life of the solution combine to bring high costs of manufacture and use, and also, malfunctions during operation.

[0005] The drawbacks of said shield being manufactured from castable in the second embodiment lie in the costs of manufacture and a construction that is tightly

sealed. Manufacture requires an individual mould, the fabrication of which adds further costs to materials and work. The shield has to be dimensioned in such a way that there will be a margin for installation. In practice, the result is relatively loose, which causes heat transfer to the frame past the shield.

[0006] The prior art technique described above is used, *e.g.*, in production at Foster Wheeler Energy Ltd. (bag) and in production as performed by the Applicant (shield manufactured by casting).

[0007] It is an object of the present invention to provide a shield that avoids prior art drawbacks. The characteristic features of construction according to the present invention are presented in the characterising clause of claim 1.

[0008] The main advantage of the present invention over the prior art technique is that the shield according to the present invention is reliable in use. In addition to being highly insulating, all parts of the shield are very resistant to the effects of high temperature. The shield is stable in construction, it is elastic, and it withstands shut-down-necessitated displacement well. As a result of the above, the shield is durable and cost-effective.

[0009] The structure according to the present invention ensures a tight seal, which also creates an extremely important advantage. The outer periphery of the shield E is elastic, and it is able to adapt to the shape of the opening. The tight seal thus obtained is efficient in preventing heat transfer past the shield.

[0010] The invention will be described in greater detail with reference to the attached drawings, wherein

Fig. 1 shows a structure according to the invention mounted on the manhole of a lined firebox,

Fig. 2 shows a shield according to the invention as viewed from its rear side

Fig. 3 shows a shield according to the invention as viewed from its front side.

[0011] With reference to the drawings, the shield according to the invention functions as follows:

[0012] Fig. 1 shows a manhole 1 of a firebox, the manhole having a round cross-section about 600 mm in diameter in this case. During the operation of the apparatus, the manhole is closed by a prior art protective face block 2. The material of the protective face block 2 is similar to the refractory ceramic cast material used for the surface layer A of the firebox's lining, and is shaped to have a shoulder along its side facing the firebox to prevent the protective block from falling into the firebox. The surface layer A of the firebox wall lining has a thermal insulation layer B. The surface lining A is to withstand the effects of thermal, chemical, and mechanical stress imposed by the combustion process that is occurring in the firebox, while the thermal insulation layer prevents thermal conduction to the firebox frame construction C. The protective face block 2 of the manhole 1 serves the same function as the firebox wall surface layer A and,

has a protective shield E according to the invention, having the same function as the thermal insulation layer B of the wall, adapted behind the face block. The protective shield E is composed as follows: Four round sheets 3 that are stacked on each other are cut from a mat of high-temperature-resistant, flexible ceramic fibre with a typical thickness of approximately 25 mm. A support element 4, e.g., advantageously, a round steel disc having a diameter smaller than that of the fibre mat sheets, is mounted on each end of the sheet stack. The support elements are advantageously made from stainless steel sheet of 1 mm thickness, for instance. Each support element 4 has four holes for mounting bolts. The disc-like support elements 4 are connected to each other via clamping elements 5, advantageously bolts and nuts, for instance, which are passed through the holes made in support elements and sheets 3. The sheets 3 and support elements 4 are held tightly against each other by such clamping elements 5, which may be bolts and nuts. The outer support element of the thus assembled shield E has two handles 6 mounted thereon for mounting the shield in place. During mounting of the shield, the edges of the sheets 3, which are oversized with respect to the dimensions of the manhole, are bent backward. After the shield E has been correctly inserted in its place in the manhole 1, the bent edges of the sheets 3 are gently pushed in to be level with the rear surface of the shield E. To remove the shield E from the manhole, its handles 6 are grabbed to pull the shield out from the manhole.

[0013] The sheets 3 manufactured from the ceramic fibre mat of the shield E according to the present invention can be shaped to fit openings of different shape. The shape of the opening, as described above, can also be oval, be angular, or have arcuate and/or straight surfaces. In their manufacture, the sheets 3 are mainly sized to be somewhat larger than the opening, in order to ensure a tight seal.

[0014] The shield E according to the invention can be employed, in addition to what has been described in the above example, for other types of openings besides manholes. For example, maintenance and explosion openings can be provided with a solution according to the invention.

[0015] The material for the sheets 3 cut from high-temperature-resistant fibre mat and forming part of the present invention, is typically a substance that chemically is mainly composed of aluminium oxide aluminium oxide (Al₂O₃), silicon oxide (SiO₂) and zirconium oxide (ZrO₃) or any of these in combination. As an example, the product named Cerablanket 1260, by Thermal Ceramics, can be mentioned. The proportions of its main substances are 44%: Al₂O₃, and 56% SiO₂, and it is heat-resistant to approximately 1260 °C. The thickness of the fabric mat used is most often approximately 25 mm.

[0016] The sheets 3 can also be manufactured from another material suitable for the purpose, and their thickness and number can be arranged individually according to the depth of the opening 1. Thus, it is possible to

achieve the total thickness of the shield E also in such a way that it helps the protective block 2 stay in position. The closed door D, for its part, supports the shield E.

[0017] In some cases, the periphery/rim of the stack formed by the sheets 3 can be covered with a fabric resistant to abrasion and high temperature. The fabric is attached to support elements or clamping elements 4, 5, and, it may be used, e.g., when the shield E has to be displaced relatively frequently.

[0018] Although this application presents one advantageous exemplary embodiment of the present invention, it is not intended to limit broader use of the invention in any way, all alternatives for implementing the invention are possible within the inventive idea defined by the claims.

Claims

1. A thermal radiation and conduction shield suitable for mounting on the rear side of a protective face block (2) placed on an opening, advantageously such as a manhole (1), in the refractory ceramic lining of a boiler, furnace, or like apparatus, **characterised in that** it is composed of sheets (3) that have essentially the size and the shape of the opening and are cut from a ceramic, elastic fibre mat, the sheets being:

- at least two in number,
- stacked evenly on each other or one after another attached to each other,

and support elements (4),

- that are at least two in number,
- that are mounted on each ends of the layered construction formed by the sheets (3), in order to support the fibre material between them to form a substantially even block with the shape of the opening,

and clamping elements (5),

- that number at least one,
- that are positioned to connect the support elements (4) to each other and thus to form a solid shield (E).

2. A shield according to claim 1, **characterised in that** the outer dimension of the sheets (3) being larger than the inner dimension of the opening (1), advantageously in such a way that the outer edges of the elastic sheets (3) adapt to the shape of the opening (1) to form a tight seal when the shield (E) is being installed.

3. A shield, according to claim 1 or 2, **characterised**

in that the material of the support elements (4) and the clamping elements (5) is stainless steel, high-temperature-resistant steel, or another material suitable for the purpose.

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4. A shield according to claim 1, 2, or 3, **characterised in that** it has at least one handle (6) attached to the other support element (4) for removal of the shield (E).

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5. A shield according to any of claims 1 to 4, **characterised in that** the thickness of the shield (E) is advantageously adapted to support the protective face block (2) and thus help keep it in its position.

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6. A shield according to any of claims 1 to 5, **characterised in that** the periphery/rim of the stack formed by the sheets (3) is covered with a suitable fabric or corresponding material resistant to abrasion and high temperature.

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Fig 1

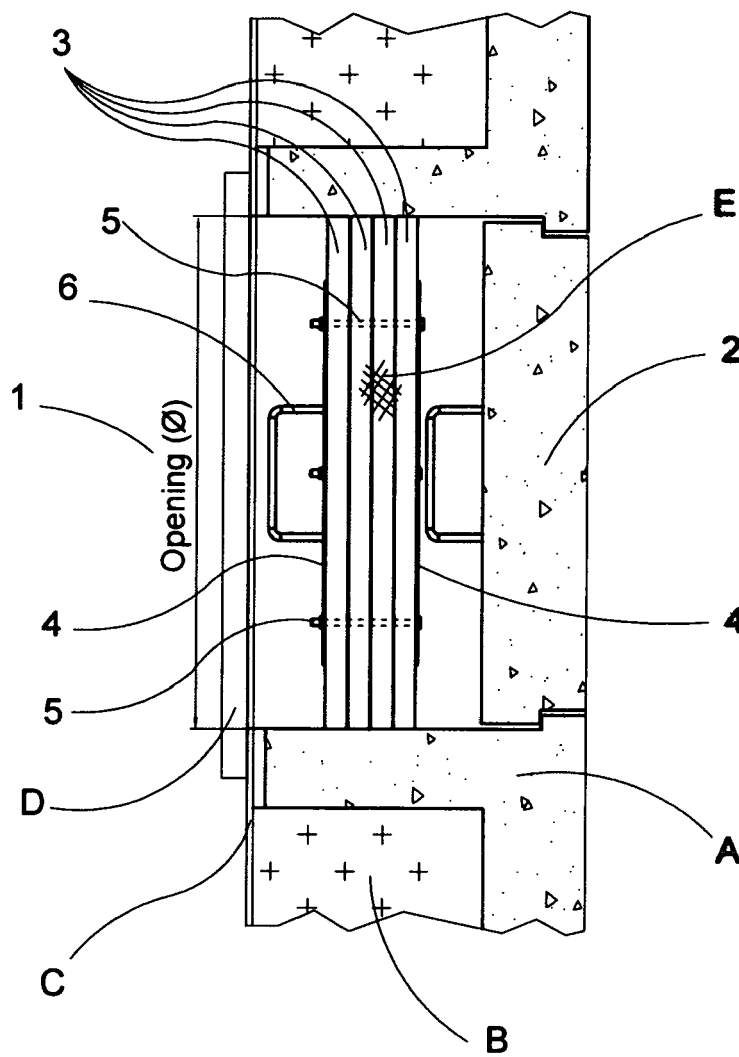


Fig 2

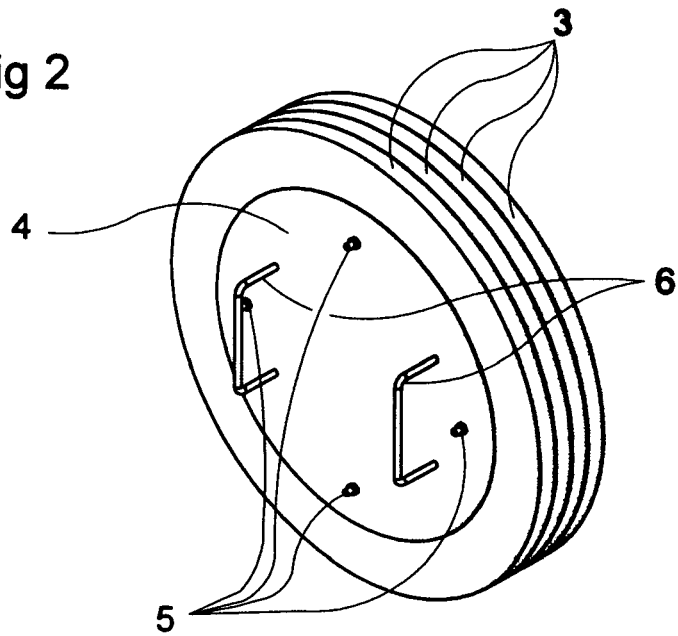
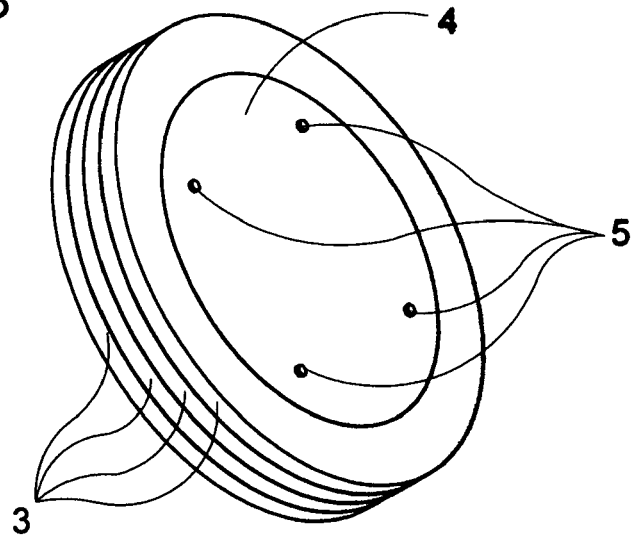


Fig 3





EUROPEAN SEARCH REPORT

Application Number
EP 09 39 6009

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CH 494 372 A (YGNIS SA [CH]) 31 July 1970 (1970-07-31)	1-6	INV. F23J13/08 F23M7/00 F27D1/18
Y	* the whole document *	1-6	
Y	DE 34 42 582 A1 (UPMANN KAMINTUERENFABRIK A [DE]) 22 May 1986 (1986-05-22) * page 7, line 14 - page 10, line 17; figures 3,4 *	1-6	
Y	DE 21 26 282 A1 (HEISTERKAMP, JOHANN) 7 December 1972 (1972-12-07) * page 4, paragraph 7 - page 5, line 1; figures 3,4 *	1-6	
Y	DE 38 26 651 A1 (PFEIFFER VAKUUMTECHNIK [DE]) 8 February 1990 (1990-02-08) * column 2, line 20 - line 32; figures 1,2 *	1-6	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			F23J F23M F27D
Place of search		Date of completion of the search	Examiner
Munich		2 February 2010	Theis, Gilbert
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 39 6009

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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02-02-2010

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82