

EUROPEAN PATENT SPECIFICATION

- ④ Date of publication of patent specification: **18.06.86** ⑤ Int. Cl.⁴: **F 27 D 1/00**
⑥ Application number: **83301228.9**
⑦ Date of filing: **08.03.83**

⑧ **Thermally insulating blocks.**

⑩ Priority: **27.03.82 GB 8209080**

⑪ Date of publication of application:
05.10.83 Bulletin 83/40

⑫ Publication of the grant of the patent:
18.06.86 Bulletin 86/25

⑬ Designated Contracting States:
AT BE CH DE FR IT LI LU NL SE

⑭ References cited:
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FR-A-2 454 071
GB-A-2 004 626
GB-A-2 070 748
US-A-3 819 468
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Description

This invention relates to a thermally insulating block for use in lining the roofs, walls, floors, doors and ducting in furnaces, kilns, ovens or the like as defined in claim 1.

It is known from EP 0 018 677 A1 to provide an oven with refractory wall panels comprising strips of refractory ceramic fibre material fastened by adhesives to a base plate. The panels are reinforced by tubes of refractory material passed into channels formed by registering holes in the strips. Also, it is known from US 3 819 468 to provide insulation for lining a furnace wall comprising strips of a ceramic fibre blanket held together by stainless steel wires.

Preferably, in this invention the retaining means is flexible, when it may be in the form of a thread or cord. Such flexible thread or cord may be threaded transversely in a back and forward fashion through the compressed strips, and may also extend around the exterior of the block.

Where the flexible thread or cord passes transversely through the block, its inherent flexibility permits the block to be flexed during installation, thus permitting it to be secured to the contour of a curved or uneven surface of an inner wall of a furnace, kiln, oven or the like.

Alternatively, however, the retaining means may be in the form of at least one "skewer" passing transversely through the compressed and side-by-side low thermal mass strips.

In one preferred embodiment of the inventive thermally insulating block, the low thermal mass material, from which the strips are made, is a refractory fibre of alumina and silica suitable for continuous exposure to operating temperatures of 1260°C (2300°F). A suitable material for operating at a higher temperature of, say, 1425°C (2600°F) is a fibrous refractory material of an alumina, silica and chromia composition.

In a further preferred embodiment of the invention thermally insulating block, the strips are U-shaped, thereby providing a block with one of its major surfaces corrugated and the other, planar.

The invention also provides a method of manufacturing a thermally insulating block comprising the steps of arranging a plurality of strips of low thermal mass material in side-by-side relationship, transversely compressing the strips together, and maintaining the so-compressed strips under compression with retaining means, extending through the interior of the block generally transversely with respect to the strips, characterised in that the retaining means is of the same material as that of the strips.

In a preferred embodiment of the inventive method, the steps of transversely compressing the strips and maintaining the strips under compression are performed simultaneously by passing the retaining means through the strips.

Preferably, the block is formed by folding a layer of low thermal mass material to form corrugations and truncating the corrugations on at

least one major face of the block to form the plurality of strips in the side-by-side relationship.

Also, the steps of transversely compressing the strips and maintaining the strips under compression precede the step of truncating the corrugations.

The thermally insulating blocks, in accordance with the invention or when made by a method in accordance therewith, can be secured to the inner surfaces of, say, a furnace, by cementing one of the major surfaces thereof and then pressing this surface against the furnace wall in the required position. In the case of the corrugated block having U-shaped strips, it is the planar major surface which is preferably secured to the internal surface of the furnace wall.

A preferred embodiment of thermally insulating block in accordance with the invention, as well as its inventive method of manufacture, will now be described by way of example and with reference to the accompanying drawing which shows a perspective view of the block.

In the drawing, a thermally insulating block 1, for use in lining the inner surfaces of a furnace wall, comprises a plurality of U-shaped strips 2 of a low thermal mass material which are secured together under compression by a retaining thread 3. This retaining thread 3 passes along the outside surface of the U-shaped strip 2 at the left hand side of the block 1, through the block at four positions transversely with respect thereto, and along two portions of the outer surface of the U-shaped strip at the right hand end of the block. The thread 3 retains the strips 2 under transverse compression and it is to be understood that any other suitable form of retaining means, such as, at least one transverse rod, may be used instead of the thread 3.

In a modified form of the block 1, a scrim cloth of the same material as that from which the strips 2 are made, is wrapped around the block, preferably leaving the opposed end faces of the U-shaped strips 2 exposed. Such wrapping can be adhesively secured to the block 1.

In the manufacture of the block 1, a single layer of low thermal mass material, such as either of those described above and capable of withstanding respective operating temperatures of 1260°C (2300°F) and 1425°C (2600°F), has been folded to form an intermediate corrugated block. One major face of the intermediate block, has then had its corrugations truncated, thereby forming the plurality of side-by-side, generally U-shaped strips 2 which are subsequently subjected to a transverse compressional force. Alternatively, and as also indicated above, this truncation step may follow the compression and retaining steps.

In this compressed state, the thread 3 passes transversely through the strips 2 and is secured in a suitable manner to maintain the block 1 under compression.

It will be appreciated that such a block 1 could also be made by forming two or more intermediate blocks, of equal thickness, which may

then be secured together in side-by-side relationship under compression.

The or each block 1 can then be fixed to the internal surface of a furnace wall by cementing the planar, truncated face thereto. Also, it will be appreciated that the transversely compressing and maintaining under compression steps can be formed simultaneously, and preferably when the retaining means is in the form of a flexible thread or cord passing transversely through the side-by-side strips, whereby tightening or tensioning of the thread or cord 3 actually compresses the strips together and, then, subsequently retains them in the compressed state.

Claims

1. A thermally insulating block (1) for use in lining the roofs, walls, floors, doors and ducting in furnaces, kilns, ovens or the like, comprising a plurality of strips (2) of a low thermal mass material, which are secured together, under compression and in side-by-side relationship, by retaining means (3) extending through the interior of the block (1) generally transversely with respect to the strips (2), characterised in that said retaining means (3) is of the same material as that of the strips (2).

2. A thermally insulating block (1) according to claim 1 wherein the retaining means (3) comprises a flexible thread or cord.

3. A thermally insulating block (1) according to claim 1 or 2 wherein the strips (2) are made of a fibrous refractory material containing alumina and silica.

4. A thermally insulating block (1) according to claim 3 wherein the fibrous refractory material also contains chromia.

5. A thermally insulating block (1) according to any preceding claim wherein the strips (2) are generally U-shaped, whereby one major surface of the block is corrugated and the other major surface of the block (1) is planar.

6. The use of the thermally insulating blocks according to any preceding claim for forming parts of a lining of a furnace, kiln, oven or the like.

7. A method of manufacturing a thermally insulating block (1) comprising the steps of arranging a plurality of strips (2) of low thermal mass material in side-by-side relationship, transversely compressing the strips (2) together, and maintaining the so-compressed strips (2) under compression with retaining means (3), extending through the interior of the block (1) generally transversely with respect to the strips (2), characterised in that the retaining means (3) is of the same material as that of the strips (2).

8. A method according to claim 7 wherein the retaining means (3) is provided as a flexible thread or cord.

9. A method according to any of claims 7 or 8 wherein the plurality of strips 2 are made of a fibrous refractory material containing alumina or silica.

10. A method according to claim 9 wherein the fibrous refractory material also contains chromia.

11. A method according to any of claims 7 to 10 wherein the steps of transversely compressing the strips (2) and maintaining the strips under compression are performed simultaneously by passing the retaining means (3) through the strips (2).

12. A method according to any one of claims 7 to 11 wherein the block (1) is formed by folding a layer of low thermal mass material to form corrugations and truncating the corrugations on at least one major face of the block to form the plurality of strips (2) in the side-by-side relationship.

13. A method according to claim 11 wherein the steps of transversely compressing the strips (2) and maintaining the strips under compression precede the step of truncating the corrugations.

Patentansprüche

1. Wärmeisolierblock (1) zur Verwendung beim Auskleiden der Abdeckungen, Wände, Böden, Türen und Rohre in Hochöfen, Röstöfen, Industrieöfen, od.dgl., bestehend aus einer Vielzahl von Streifen (2) eines Materials mit niedriger thermischer Masse, die mit Hilfe von Sicherungsmitteln (3), welche im wesentlichen quer zu den Streifen (2) das Innere des Blocks (1) durchsetzen, unter Pressung und Seite an Seite zusammengehalten sind, dadurch gekennzeichnet, daß die Sicherungsmittel (3) aus dem gleichen Material bestehen wie die Streifen (2).

2. Wärmeisolierblock (1) nach Anspruch 1, dadurch gekennzeichnet, daß die Sicherungsmittel (3) einen flexiblen Faden oder eine flexible Schnur aufweisen.

3. Wärmeisolierblock (1) nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Streifen (2) aus einem feuerfesten Fasermaterial hergestellt sind, das Aluminiumoxyd und Siliziumoxyd enthält.

4. Wärmeisolierblock (1) nach Anspruch 3, dadurch gekennzeichnet, daß das feuerfeste Fasermaterial auch Chromoxyd enthält.

5. Wärmeisolierblock (1) nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Streifen (2) im wesentlichen U-förmig sind, wobei eine Hauptoberfläche des Blocks gewellt und die andere Hauptoberfläche des Blocks (1) eben ist.

6. Verwendung eines Wärmeisolierblocks nach einem der vorhergehenden Ansprüche als Teil der Auskleidung eines Hochofens, Röstofens, Industrieofens od. dgl.

7. Verfahren zur Herstellung eines Wärmeisolierblocks (1) welches folgende Schritte aufweist: Anordnung einer Vielzahl von Streifen (2) niedriger thermischer Masse Seite an Seite, gegenseitiges Zusammenpressen der Streifen (2) in Querrichtung, Halten der solchermaßen zusammengepreßten Streifen (2) unter Druck mit Hilfe von Sicherungsmitteln (3), die sich durch das Innere des Blocks (1) im wesentlichen quer zu

den Streifen (2) erstrecken, dadurch gekennzeichnet, daß die Sicherungsmittel (3) aus dem gleichen Material bestehen wie die Streifen (2).

8. Verfahren nach Anspruch 7, dadurch gekennzeichnet, daß die Sicherungsmittel (3) als flexibler Faden oder flexible Schnur ausgebildet sind.

9. Verfahren nach einem der Ansprüche 7 od. 8, dadurch gekennzeichnet, daß die Vielzahl von Streifen aus einem feuerfesten Material hergestellt ist, das Aluminiumoxyd oder Siliziumoxyd enthält.

10. Verfahren nach Anspruch 9, dadurch gekennzeichnet, daß das feuerfeste Material auch Chromoxyd enthält.

11. Verfahren nach einem der Ansprüche 7 bis 10, dadurch gekennzeichnet, daß die Schritte des Querverpressens der Streifen (2) und des Unter-Druck-Haltens der Streifen gleichzeitig, mittels Durchsetzen der Sicherungsmittel (3) durch die Streifen ausgeführt werden.

12. Verfahren nach einem der Ansprüche 7 bis 11, dadurch gekennzeichnet, daß zur Herstellung des Blocks (1) eine Lage niedriger thermischer Masse unter Bildung von Wellungen gefaltet wird und zumindest an einer Hauptoberfläche des Blocks die Wellungen abgeschnitten werden, um die Vielzahl von Seite-an-Seite gelegenen Streifen (2) herzustellen.

13. Verfahren nach Anspruch 11, dadurch gekennzeichnet, daß die Schritte des Querverpressens der Streifen (2) und des Unter-Druck-Haltens der Streifen vor dem Schritt des Abschneidens der Wellungen erfolgen.

Revendications

1. Bloc d'isolation thermique (1) pour le revêtement de plafonds, parois, sols, portes et conduits dans des fourneaux, étuves, fours ou constructions analogues, comprenant des bandes (2) d'un matériau à faible masse thermique, qui sont fixées ensemble, sous compression et en étant placées côte à côte, par un moyen d'assemblage (3) qui s'étend au travers de l'intérieur du bloc (1), suivant une direction générale transversale aux bandes (2), caractérisé en ce que le moyen d'assemblage (3) est du même matériau que les bandes (2).

2. Bloc d'isolation thermique (1) selon la revendication 1, dans lequel le moyen d'assemblage (3) est formé par un fil ou une corde flexible.

3. Bloc d'isolation thermique (1) selon la revendication 1 ou 2, dans lequel les bandes (2) sont faites d'un matériau réfractaire fibreux contenant de l'alumine et de la silice.

4. Bloc d'isolation thermique (1) selon la revendication 3, dans lequel le matériau réfractaire fibreux contient également du sesquioxyde de chrome.

5. Bloc d'isolation thermique (1) selon l'une quelconque des revendications précédentes, dans lequel les bandes (2) possèdent une section droite de forme générale en U, de sorte qu'une grande face du bloc est ondulée, et l'autre grande face du bloc (1) est plane.

6. Bloc d'isolation thermique selon l'une quelconque des revendications précédentes, destiné à faire partie d'un revêtement d'un fourneau, d'une étuve, d'un four ou d'une construction analogue.

7. Procédé pour fabriquer un bloc d'isolation thermique (1), comprenant la disposition côte à côte de bandes (2) d'un matériau à faible masse thermique, la compression transversale conjointe des bandes (2) et le maintien des bandes (2) ainsi comprimées à l'état comprimé par un moyen d'assemblage (3) s'étendant au travers de l'intérieur du bloc (1), suivant une direction générale transversale aux bandes (2), caractérisé en ce que le moyen d'assemblage (3) est du même matériau que les bandes (2).

8. Procédé selon la revendication 7, dans lequel le moyen d'assemblage (3) est un fil ou une corde flexible.

9. Procédé selon la revendication 7 ou 8, dans lequel les bandes (2) sont faites d'un matériau réfractaire fibreux contenant de l'alumine ou de la silice.

10. Procédé selon la revendication 9, dans lequel le matériau réfractaire fibreux contient également du sesquioxyde de chrome.

11. Procédé selon l'une quelconque des revendications 7 à 10, dans lequel la compression transversale des bandes (2) et le maintien des bandes sous compression sont effectués simultanément en passant le moyen d'assemblage (3) au travers des bandes (2).

12. Procédé selon l'une quelconque des revendications 7 à 11, dans lequel le bloc (1) est formé en pliant en accordéon une couche de matériau à faible masse thermique, de manière à former des ondulations, puis en tronçonnant la couche ainsi pliée pour enlever les ondulations sur au moins une grande face du bloc et pour former les bandes (2) placées côte à côte.

13. Procédé selon la revendication 11, dans lequel la compression transversale des bandes (2) et le maintien des bandes sous compression précèdent le tronçonnage.

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