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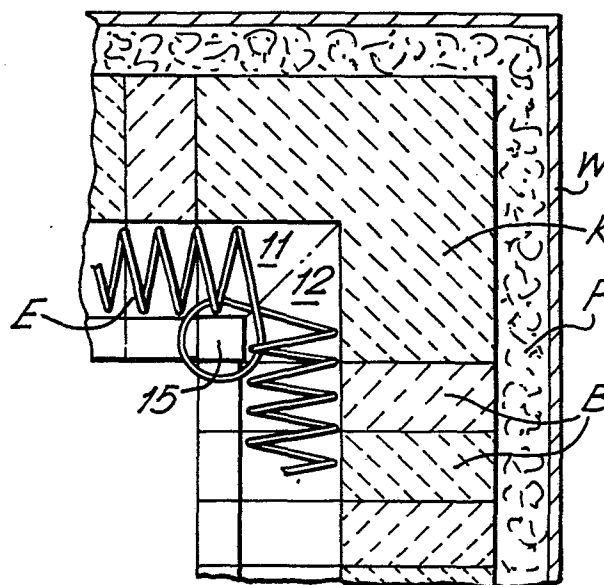
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Improved heating chamber having electrical heating elements.

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A heat chamber includes a wall W having a lining of compressible blocks B of ceramic fibre, the blocks being compressed. The blocks have aligned cut outs C in which are received electrical heating elements E. Corner units K are present in the corners and have conduits (11, 12) to receive the elements which are held to the units, e.g. by being looped about the shoulder (15). Loose fibre F is present between the blocks B and the backing wall W.



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IMPROVED HEAT CHAMBER
HAVING ELECTRICAL HEATING ELEMENTS

The invention relates to an improved heat chamber, especially a chamber in which the heating is caused by electric heating elements.

It is known to line a heat chamber with blocks made of ceramic fibre. Generally the blocks are held together in stacks or modules and various arrangements have been proposed for aligning the blocks so as to obtain the best heat insulating effect. Usually the blocks are held to an outside support wall by studs, anchors or cement. It is known to locate a heating element on the lining by hanging the heating element on the exposed heads of the studs or anchors. It is also known to have a spiral wire electric heating element and to insert a ceramic supporting rod through the centre of the spiral.

It is one object of the invention to provide an improved wall for a heat chamber in which blocks of ceramic fibre are used. It is another object to provide a heat chamber which

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may be heated up or cooled quickly. It is another object to provide such a chamber in which the electric heating element has an improved life. Another object is to provide a chamber which is simple and inexpensive to make, assemble and operate.

According to one aspect of the invention, there is provided a heat chamber wall having at least one heating element anchored at opposite sides of the wall, the wall comprising a heat insulating inner lining made up of blocks of ceramic fibre, characterised in that each block has a slot adjacent one face, the blocks being arranged in side-by-side relation under compression with the one face of adjacent blocks being aligned, and the heating element extending through the slots of the aligned blocks.

The heating element is located within the slot in the thickness of the compressed block of ceramic fibre; as a result the element is not exposed to the corrosive atmosphere of the heat chamber interior; the heating element is thus partially shielded and its life is thereby prolonged. Additionally, the heating element is protected from damage when the heat chamber is loaded and unloaded. Because the blocks of ceramic fibre are held under compression, serious cracks do not form in the lining nor do the blocks come apart, and in this way the useful life of

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the lining is prolonged.

The term "block" is used herein in a general sense to cover a range of preformed items such as blankets, batts, boards, bricks and the like. The blocks may be made of a variety of ceramic fibres provided that the blocks are compressible, and mixtures of fibres may be used. Preferably the fibres are selected according to their low thermal conductivity, low thermal mass, low density and high thermal shock resistance.

According to another aspect of the invention there is provided for use in making an insulating lining for a heat chamber, a block of compressible ceramic fibre, characterised in that the block has at least one slot extending through the thickness to receive a heating element, the slot being spaced from one edge of the block and preferably having a throat portion leading from the edge of the block to the slot.

According to another more specific aspect of the invention there is provided a compressible block of ceramic fibre, the block being generally rectangular as seen in plan view and having a thickness, the block having at least one slot for receiving a length of a heating coil, the slot comprising a generally circular portion set back from a longer wall of

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the block and a throat portion leading from the circular portion to the edge of the wall.

It has also been realised according to this invention, that because the blocks of compressible ceramic fibre are relatively weak, the tension of the stretched wire can cause some problems and accordingly the invention also provides a retaining unit which will avoid these problems and characterised in that the unit comprises a block formed of electrically insulating material having at least two conduit portions joined together at an angle, the unit including in the region of the join a shoulder for anchoring of the element.

The electric heating element may be anchored to the shoulder in a variety of ways, one simple way being simply to loop the wire around the shoulder.

The conduits of the retaining unit may have any combination of inlet and outlet and may be of various shapes as seen in plan, like the letter "L", "T", "X" and "Y".

According to another more specific aspect, there is provided a heat chamber having two walls defining a corner, a stretched electric heating element anchored at opposite sides of each wall, each wall comprising a heat insulating

inner lining made up of blocks of ceramic fibres, characterised in that each block has a slot adjacent one face and in that the blocks are arranged in side-by-side relation under compression with the one face of adjacent blocks being aligned, the blocks being unsecured to the backing wall, and in that the heating element extending through the slots of the aligned blocks, the corner containing a retaining unit comprising a block formed of electrically insulating material having at least two conduit portions joined together at an angle, the unit including in the region of the join a shoulder for retaining the element.

In general the blocks do not need to be secured to the backing wall but where that wall is long, it may be useful to secure a block to the wall at intervals of say 30 cm.

In order that the invention may be well understood it will now be described by way of example, with reference to the accompanying diagrammatic drawings, in which

Figure 1 is a partial perspective view of one open kiln,

Figure 2 is a side view of one ceramic fibre block used in the the insulating lining of the kiln of

Figure 1;

Figure 3 is a perspective view of the block of

Figure 2 showing the heating element;

Figure 4 is a side elevation of one corner unit; and

Figure 5 is a sectional view taken on lines V-V on

Figure 4.

The kiln of figure 1 comprises a box-like chamber having a lid, not shown. The walls of the kiln chamber are lined with an insulating lining made up of blocks of ceramic fibre blanket. Each block is generally rectangular or slab like and has at one side cut outs C; as shown in Figure 2 there are three such cut outs C arranged one above the other. Each cut out C comprises a throat 2 leading to a generally bulbous socket 3. One wall of the throat 2 is flat and the other 5 is inclined. Each block is compressible. The blocks are aligned in side-by-side relation with the cut outs C facing the interior of the chamber. The blocks are compressed by about 25% of their thickness and are held loose against the back wall of the chamber between corner units K in the corner of the kiln chamber.

The corner unit K shown in Figure 4 and 5 comprises a cast block of refractory or ceramic electrically insulating material. The block has conduits 11, 12, formed in a corner, the conduits being orthogonally arranged. Each conduit has an arcuate base 13 and an upwardly inclined throat 14. A shoulder 15 is formed at the common inner

corner, and this is rectangular as seen in plan. The corner unit K is mounted in a corner of a kiln according to Figures 1 to 3, with compressed blocks B of ceramic fibre being abutted against each free face of the corner unit K and loose fibre blanket F being placed between the corner unit and the backing kiln wall.

The kiln is electrically heated by rows of spiral or coiled heating elements E. The heating elements are stretched when received from the supplier and the element is received in the conduits 11, 12, in the refractory blocks K in the corners of the kiln chamber, and looped about the shoulder 15. The element E is pushed into the cut outs of the blocks B along its length. The kiln is loaded and the lid is placed in position. The current is switched on and the load in the kiln is heat treated as required. Because the heating element is anchored by being looped about the shoulder 5, it retains its shape within the cut outs of the blocks B, which are generally weak. This feature avoids the need to encase the heating elements in other more expensive less effective means.

In one example, the corner unit K measures 7.5 cm wide x 7.5 cm broad and 22.5 cm high. There are three sockets, about 3.5 cm vertically apart, and each conduit measures about 3.5 cm deep and is of about 2.5 cm in diameter. The shoulder 5

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measures about 1 cm square and stands about 1.3 cm above the floor of the conduit. The distance from the top of the shoulder 5 to the top of the wall 4 is about 3.5 cm.

In use the blocks are placed in position and compressed. The elements E are positioned with their ends anchored. The kiln is loaded and the lid is placed in position. The current is switched on and the load in the kiln is heat treated as required. Because the element is located in a socket 3 placed slightly back from the face of the block, the element is shielded from the corrosive atmosphere in the kiln chamber arising from the articles being treated and therefore has a prolonged useful life. The shaping of the throat tends to keep the element in position. As the element is heated and cooled it tends to change in length but because it is trapped at its ends and the blocks are compressed, neither the element nor the blocks come to any harm. There is little serious cracking or damage of the insulating lining. The kiln is cheap and simple to assemble and operate. The kiln may be heated up quickly and, as has been confirmed by repeated testing, may be allowed to operate overnight using cheap rate electricity only. The kiln also cools quickly as a result of which the load may be removed without prolonged delay. As a result the kiln may be put through short but effective working cycles, so increasing productivity.

Although the invention has been described in relation to a kiln, it is equally applicable to any low thermal mass heat chamber such as heat treatment furnaces, forge furnaces, circular furnaces, hearth furnaces, ceramic kilns, laboratory kilns, glost kilns, biscuit kilns, tunnel kilns and the like. Some of the blocks may be anchored to the backing wall at intervals of about 20 to 30 cm apart, using studs or the like. Refractory blocks may be present at points along the length of the elements in addition to the ends.

CLAIMS

1. A heat chamber wall having at least one heating element anchored at opposite sides of the wall, the wall comprising a heat insulating inner lining made up of blocks of ceramic fibre, characterised in that each block has a slot adjacent one face, the blocks being arranged in side-by-side relation under compression with the one face of adjacent blocks being aligned, and the heating element extending through the slots of the aligned blocks.

2. A heat chamber wall according to Claim 1 characterised in that the majority of the blocks are not secured to the backing wall.

3. A heat chamber wall according to Claim 2 characterised in that loose fibres are present in the gap between the blocks and the underlying wall.

4. A heat chamber wall according to Claim 1, 2 or 3 characterised in that the blocks are formed of compressible fibres and may be compressed by about 25% of their thickness.

5. A heat chamber having two walls according to any preceding Claim defining a corner, a stretched electric heating element anchored at opposite sides of each wall characterised in that the corner contains a retaining unit comprising a block formed of electrically insulating material having at least two conduit portions joined together at an angle, the unit including in the region of the join a shoulder for retaining the element.

6. A heat chamber having two walls defining a corner, a stretched electric heating element anchored at opposite sides of each wall, each wall comprising a heat insulating inner lining made up of blocks of ceramic fibres, characterised in that each block has a slot adjacent one face and in that the blocks are arranged in side-by-side relation under compression with the one face of adjacent blocks being aligned, the majority of the blocks being unsecured to the backing wall, and in that the heating element extending through the slots of the aligned blocks, the corner containing a retaining unit comprising a block formed of electrically insulating material having at least two conduit portions joined together at an angle, the unit including in the region of the join a shoulder for retaining the element.

7. A heat chamber according to Claim 5 or 6 characterised

in that the chamber is selected from heat treatment furnaces, forge furnaces, circular furnaces, hearth furnaces, ceramic kilns, laboratory kilns, glost kilns, biscuit kilns and tunnel kilns.

8. For use in making an insulating lining for a heat chamber, a block of compressible ceramic fibre, characterised in that the block has at least one slot extending through the thickness to receive a heating element, the slot being spaced from one edge of the block and, preferably having a throat portion leading from the edge of the block to the slot.

9. A block according to Claim 8 characterised in that the block is generally rectangular as seen in plan view and having a thickness and in that the slot comprises a generally circular portion set back from a longer wall of the block and in that the throat portion leads from the circular portion to the edge of the wall.

10. A retaining unit characterised in that the unit comprises a block formed of electrically insulating material having at least two conduit portions joined together at an angle, the unit including in the region of the join a shoulder for anchoring of the element.

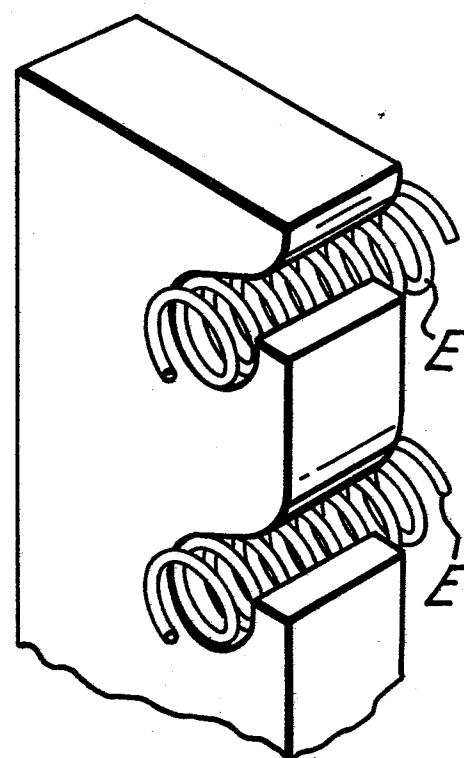
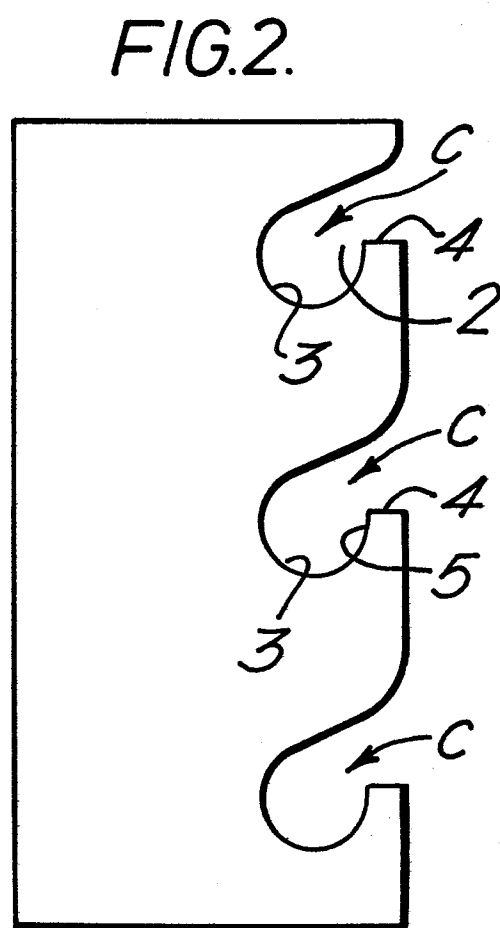
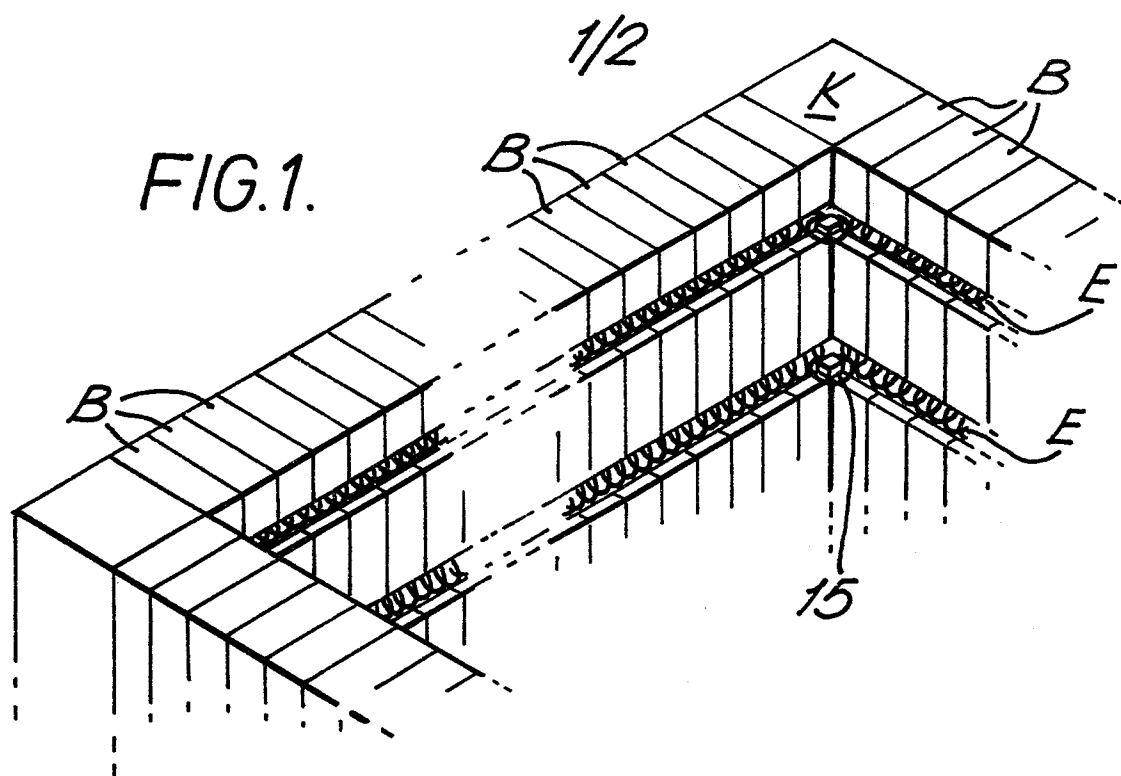
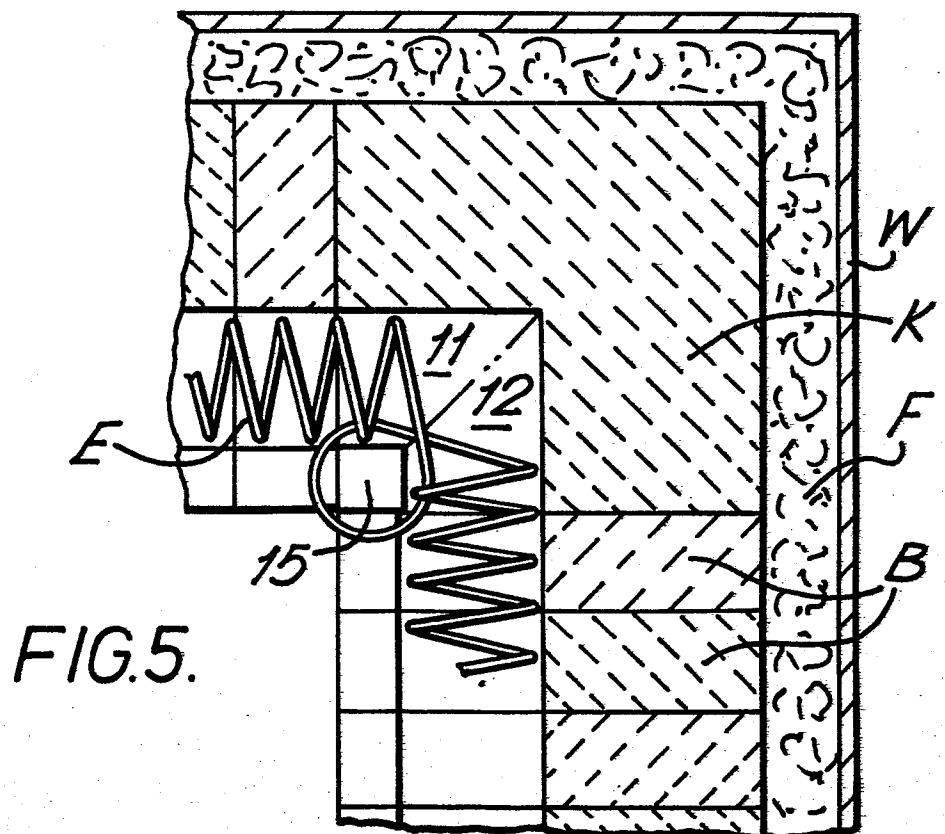
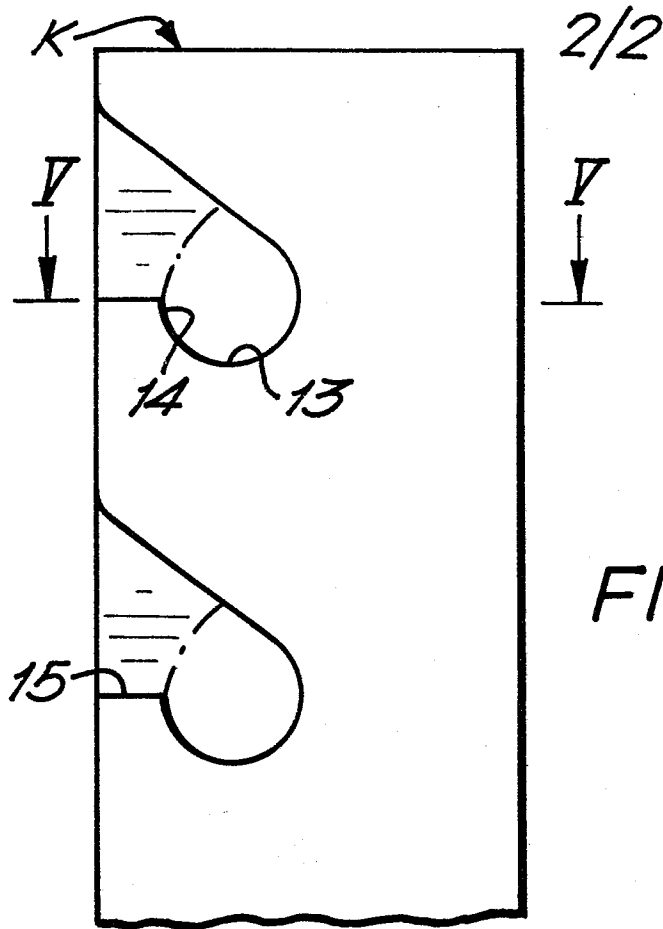


FIG.3.





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EUROPEAN SEARCH REPORT

0122069

Application number

EP 84 30 1787

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Y	US-A-3 350 493 (G.B. RANDALL) * Column 2, lines 10-21; figure 4; claims *	1,5-8, 10	H 05 B 3/66 F 27 D 1/00
Y	EP-A-0 035 944 (FOURS M.G.R. S.A.) * Claims; figures *	1,2,4	
Y,D	GB-A-1 441 577 (A.G. DOCKX) * Claims; figures *	1,4	
A	DE-C- 966 401 (BROWN, BOVERI & CIE AG)		
A	FR-A-2 382 662 (SAUDER)		
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			F 27 D H 05 B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 08-05-1984	Examiner COULOMB J.C.
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	