United States Patent

[11] 3,591,152

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[21] Appl. No. **847,856**
[22] Filed **Aug. 6, 1969**
[45] Patented **July 6, 1971**
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[54] **FURNACE INSULATION SUPPORT SYSTEM**
7 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** **263/46,** 263/50
[51] **Int. Cl.** **F23m 5/00**
[50] **Field of Search** ..... 263/46, 50; 110/1 A

[56] **References Cited**

UNITED STATES PATENTS

594,848	12/1897	Bernhard	110/1 A
1,596,695	8/1926	Stevens	110/1 A

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Attorney—J. Maguire

ABSTRACT: A furnace lining anchoring and support system in which flexible ceramic fiber insulating blankets, exposed to the furnace atmosphere, are anchored in place by a plurality of elongated hollow retainers positioned about the furnace interior and behind the blankets. The retainers each have a longitudinal slot through which portions of the blankets, together with additional insulation packing, are stuffed into the hollow part of the retainer for capture therein to securely anchor the blankets and thermally shield the retainers from furnace radiant heat.

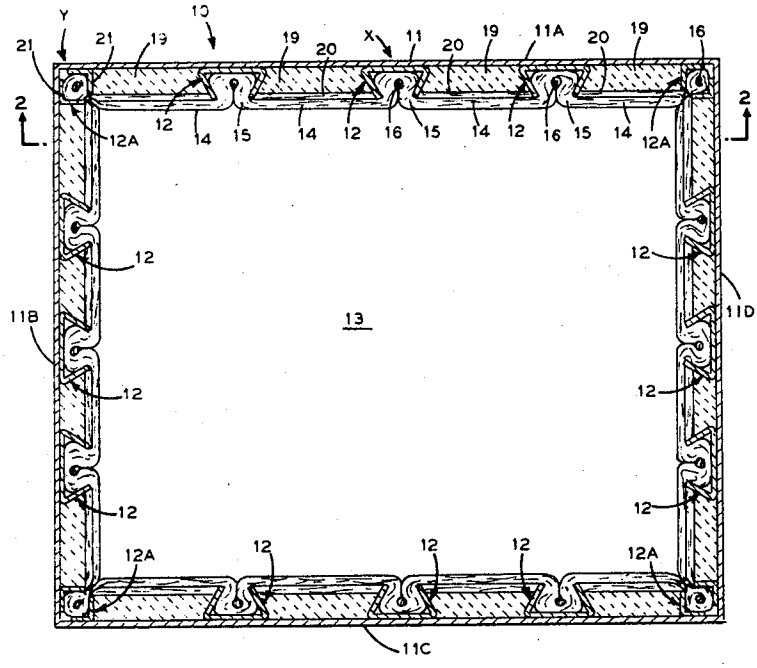


FIG. 1

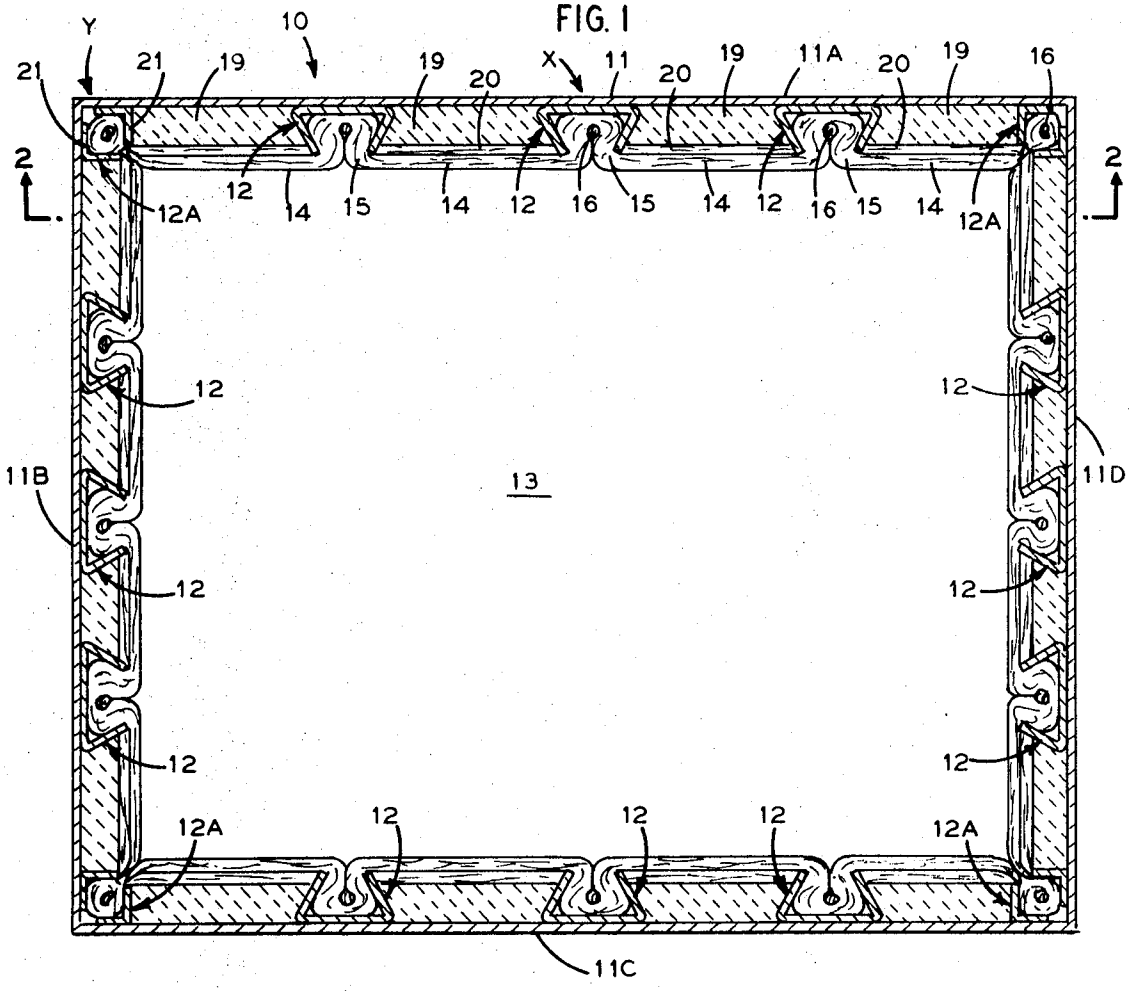
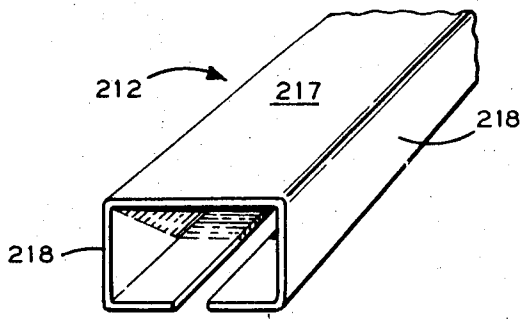


FIG. 8



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FIG. 2

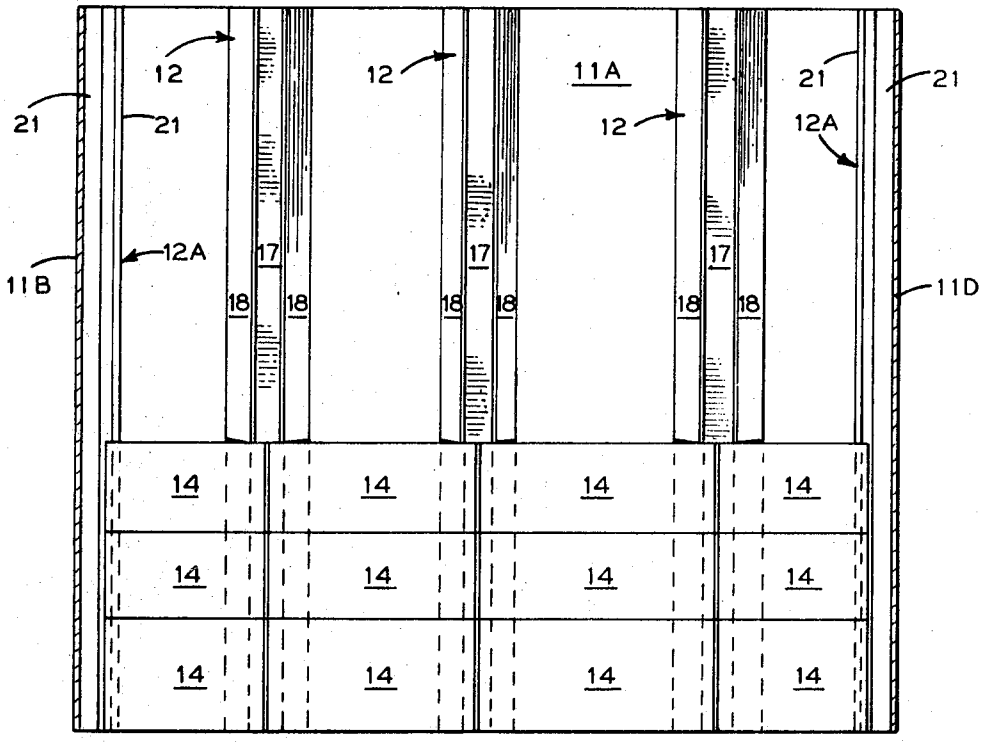

12
12
11A
21
21
21
12
12A
12A
17
17
17
11B
11D
18
18
18
18
18
18
14
14
14
14
14
14
14
14
14
14
14
14

FIG. 3

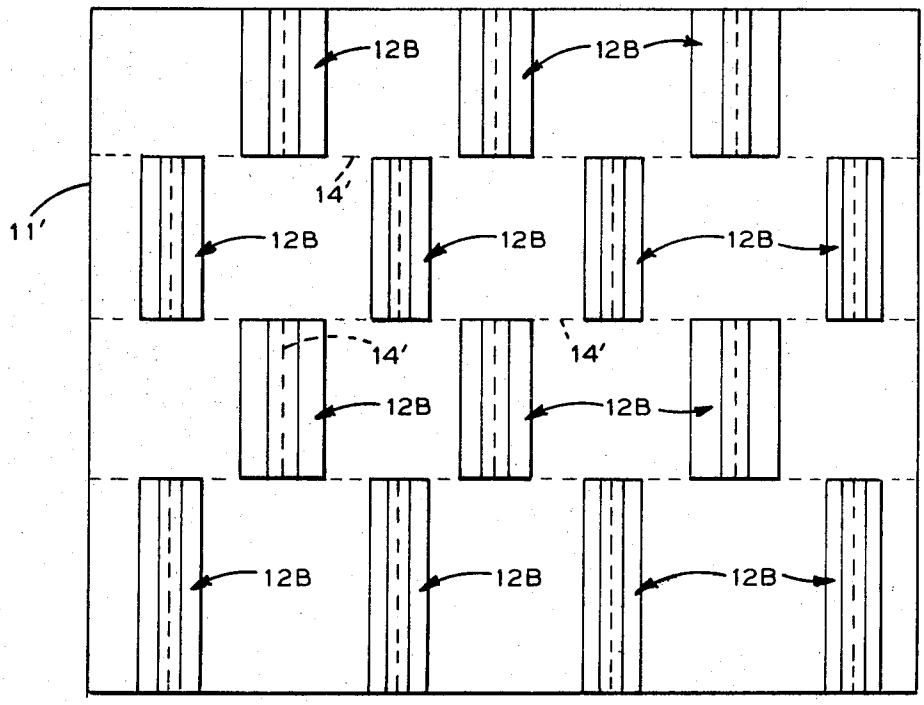

12B
12B
11'
14'
12B
12B
12B
14'
14'
12B
12B
12B
12B
12B

FIG. 4

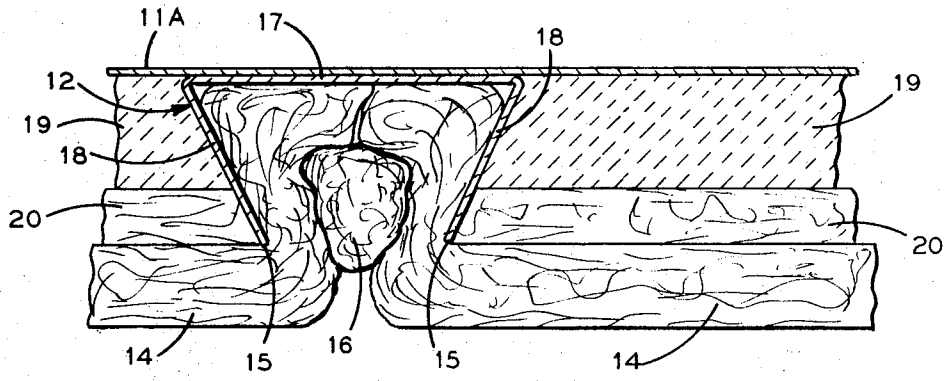


FIG. 5

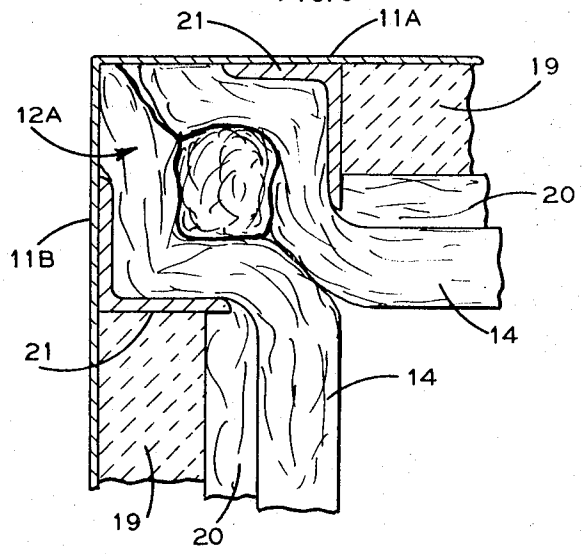


FIG. 6

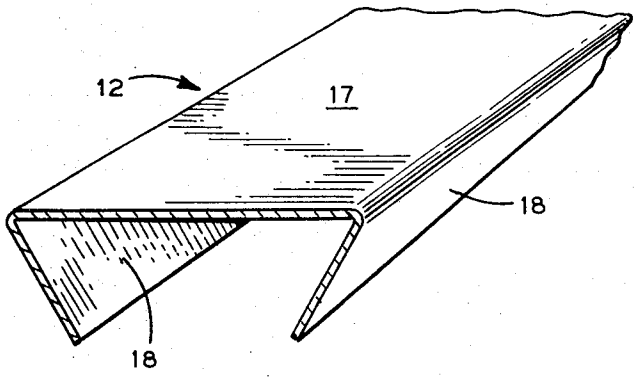


FIG. 9

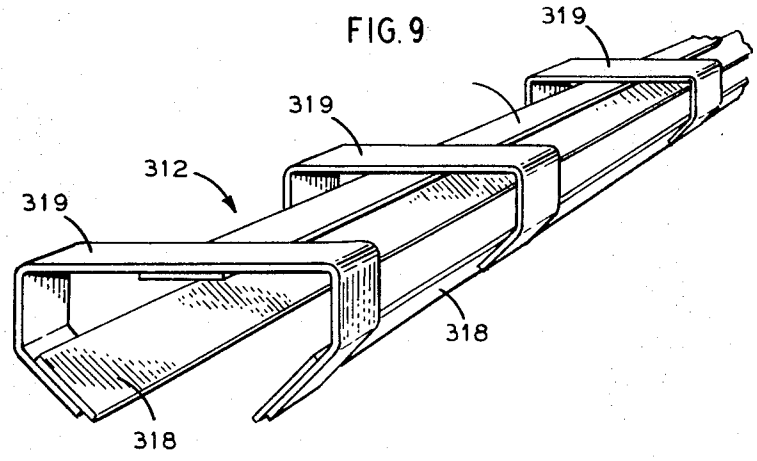
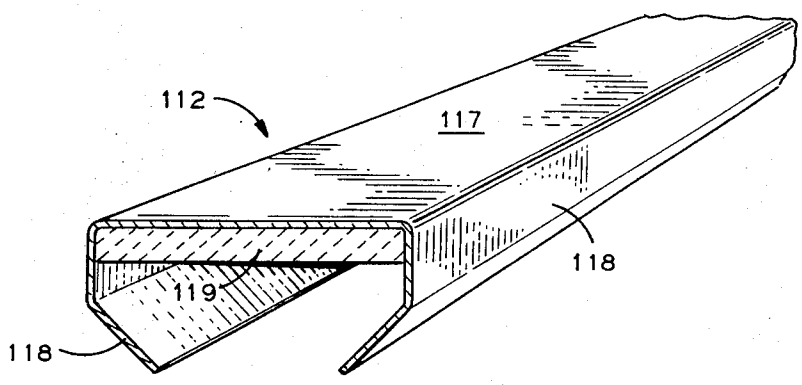


FIG. 7



FURNACE INSULATION SUPPORT SYSTEM

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates in general to the lining of furnaces, and more specifically to a furnace lining support and retention system that is particularly adapted for use with flexible blanket linings of fibrous insulation, such as Kaowool, fiberglass and the like.

Heretofore, furnace wall linings of ceramic fibers have been anchored by means of protruding studs anchored to the casing structure. These studs are ordinarily made of alloy steel, and because they are in some degree exposed to the furnace atmosphere, have a practical useful temperature limit of about 2000° F., whereas the fiber insulation itself is capable of withstanding much higher temperatures.

In some cases, the temperature limitations of steel studs have been avoided by the substitution of dense ceramic anchoring parts. However, dense ceramic parts exposed to furnace atmospheres are subject to failure due to thermal shock.

To overcome the problems encountered in the prior art use of fibrous blanket furnace linings, the invention proposes an insulation anchoring and retaining system in which flexible blankets of fiber insulation exposed to the furnace atmosphere are supported by a plurality of elongated hollow retainers positioned about the interior of the furnace casing behind the blankets, and connected to the furnace casing wall structure for support thereby in parallel spaced-apart relation to one another. These retainers, which can be made of metal, each have relatively narrow longitudinal slot facing toward the furnace interior. Selvage or surplus portions of the blankets are stuffed through the slots into the hollow part of the retainer for capture therein to securely anchor the blanket. Additional insulation material, which can be similar to that of the blanket, is preferrably stuffed through the slot to assure that the hollow part of the retainer will be filled with compacted insulation to thereby aid in anchoring the blanket and thermally shield the retainer from exposure to the furnace atmosphere.

Thus, with the system of the instant invention, there are no metal or dense ceramic parts exposed to furnace atmosphere, and advantage that permits use of an insulation blanket lining in furnaces that will operate at temperatures above the tolerance of the blanket retainer material but yet below the tolerance of the blanket material itself. In such furnace, there are no unprotected joints between adjacent blankets. This eliminates the possibility that a joint will open or the end of the blanket will sag exposing the backup insulation of the furnace shell to the high temperature of the furnace. It is therefore evident to those skilled in the art that the invention affords full insulating quality over the entire hot face lining.

An additional advantage of the invention arises from the fact that the blanket retainers, because of their shape and connection to the case wall contribute to the overall structural integrity of the furnace.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawing and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a schematic plan view of a furnace provided with a fiber blanket insulation liner installed in accordance with a preferred embodiment of the invention.

FIG. 2 is an elevational view, taken along line 2–2 of FIG. 1 showing a portion of the furnace wall with insulation removed to expose the insulation blanket retainers.

FIG. 3 is an elevation view of a furnace wall similar to that shown in FIG. 2 but having an alternate arrangement of insulation blanket retainers.

FIG. 4 is an enlarged detail view of a portion of FIG. 1 designated by the reference character "X."

FIG. 5 is an enlarged view of a portion of FIG. 1 designated by the reference character "Y."

FIG. 6 is a perspective view of a lengthwise portion of a typical blanket retainer used in the furnace of the FIGS. 1 and 2.

FIG. 7 is a perspective view of a lengthwise portion of another type of blanket retainer that can be used in the furnace of FIGS. 1 and 2.

FIG. 8 is a perspective view of a lengthwise portion of a further type of blanket retainer that can be used in the furnace of FIGS. 1 and 2.

FIG. 9 is a perspective view of an alternate configuration of blanket retainer that can be used in the furnace of FIGS. 1 and 2.

DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

The furnace 10 exemplified in FIGS. 1 and 2 is generally in the form of a rectangular parallelpiped, having a casing wall structure 11 including four rectangular vertical sidewalls 11A, 11B, 11C and 11D. These walls 11A—11D are expediently fabricated from steel plates and beams.

To the inside faces of walls 11A—11D are connected, as by welding, a plurality of channellike, elongated hollow retainers 12 that are positioned about the furnace interior zone 13 in parallel, spaced-apart relation to one another and are approximately coextensive in length with the height dimensions of walls 11A—11D. These retainers 12 serve to support and anchor flexible blankets 14 of ceramic fiber insulation such as Kaowool, fiberglass and the like, that make up the hot face lining of furnace 10.

For such purpose, each retainer 12 has a narrow longitudinal slot 15 facing the interior zone 13 and through which a portion of a corresponding blanket 14 is inserted into the hollow part of the retainer for capture therein to securely anchor the blanket 14. To aid in anchoring the blankets 14, additional compressible fiber insulation wads 16 are compacted into the hollow parts of the retainers 12.

As better seen in FIGS. 4 and 6, each retainer 12 has a back web 17 that abuts against a corresponding wall 11A—11D, and a pair of opposing lip parts 18 that extend convergently from web 17 to define the slot 15. In practice, the width of slot 15 and the other dimensions of retainer 12 can be determined by the application of routine engineering techniques once the thickness and densities of the blankets 14 and wads 16 are chosen.

In addition to the hot face insulation lining blankets 14, the furnace 10 is provided with block insulation 19 installed between adjacent retainers 12 to form a backing for the blanket insulation and to protect the casing 11 from hot furnace gases. Between the block insulation 19 and the blanket 14 insulation are installed additional layers of fibrous insulation 20.

At the corners of furnace 10, a somewhat different type of blanket retainer 12A is provided. As illustrated in FIG. 5, the retainer 12A is made from a pair of angle sections 21, one angle section 21 affixed to one wall 11A—11D intersecting at the corner, and the other angle section 21 affixed to the other intersecting wall 11A—11D. With the angle sections 21 positioned in the spaced-apart relation shown in FIG. 5, the retainer 12A has a longitudinal slot 15A that faces diagonally toward the interior zone 13 and serves the same purpose as the slots 15 in retainers 12.

It can thus be appreciated by the artisan that with the insulation support system of the invention, no part of the casing walls 11A—11D or the retainers 12, 12A is exposed to the furnace atmosphere. This allows the retainers 12, 12A to be made of steel without any ceramic coating, and the furnace 10 to operate up to the full temperature limit of the blanket 14 material.

With the arrangement of retainers **12**, **12A** shown in FIGS. **1** and **2**, there are several options as to the manner in which the hot face lining can be installed.

It is possible to use a single, large blanket **14** having a width approximating the height of walls **11A—11D** and a length approximating their perimeter. With such a blanket **14**, the starting and finishing vertical edge portions would be inserted into a common retainer **12**, **12A** and portions of the blanket intermediate these edge portions would be stuffed into successive retainers **12**, **12A** around the perimeter of furnace **10**.

Because of handling problems; lining the furnace **10** with a single blanket **14** is somewhat less practical than making the hot face lining from a plurality of smaller blankets **14**, each having a width less than the height of walls **11A—11D**.

Expediently the lengths of such smaller blankets **14** as are shown in FIGS. **1** and **2**, are less than the perimeter of walls **11A—11D**, and are multiples of the spacing between pairs of adjacent retainers **12**. The blankets **14** are thus installed in adjacent relation to one another with the edge portions of each adjoining pair of blankets **14** covering the same elevation span being inserted into the slot **15**, **15A** of a common retainer **12**, **12A**.

Where one or more blankets **14** are of such length as to span more than two retainers **12**, **12A**, at each intermediate retainer **12**, **12A**, overlying portions of the blanket **14** are stuffed into the slot **15**, **15A** thereof so that no blanket **14** will have an unanchored span greater than the spacing between adjacent retainers **12**, **12A**.

FIG. **3** exemplifies a furnace wall **11'** provided with insulation blanket retainers **12B** similar to the retainers **12** in transverse cross section, but extending over a fraction of the height of wall **11'**. The retainers **12B** are arranged parallel to one another and in successive horizontal rows, with the retainers **12B** of vertically adjacent rows being in staggered order. This allows the use of insulation blankets **14'** (shown in phantom) that are approximately equal in width to the length of the retainers **12B**, and approximately equal in length to the spacing between adjacent retainers **12B** in the same row.

FIGS. **6—9** serve to illustrate that the blanket retainers used in the practice of the invention are not restricted to any specific geometry.

In the case of the retainer **12** of FIG. **6**, the flat back web **17** and convergent flat lips **18** provide a hollow region that is generally trapezoidal in transverse cross section.

The basic geometry of the retainer **12** can be modified as in FIG. **7** to provide a retainer **112** having a web **117** and bent lips **118** that give a hollow region configuration permitting the installation and retention therein of a slab of insulation **119**.

The retainer **112** configuration can be further modified as in

FIG. **8** to provide a retainer **212** having a web **217** and lips **218** bent to provide a hollow region of rectangular transverse cross section which, as in the case of retainer **112**, allows the installation of an insulation slab against the web **217**.

FIG. **9** shows the basic geometry of the retainer **112** can be achieved in a retainer **312** that is made by welding together a plurality of openly spaced longitudinal bars **318**, **317** and bent bands **319**.

While in accordance with the provisions of the statutes there is illustrated and described herein a specific embodiment of the invention, those skilled in the art will understand that changes may be made in the form of the invention covered by the claims, and that certain features of the invention may sometimes be used to advantage without a corresponding use of the other features.

What I claim is:

1. An insulation support system for a furnace wall which comprises in combination a plurality of elongated hollow retainer means positioned in the walls of the furnace about the hot zone of the furnace, and at least one flexible blanket of insulation positioned between said zone and retainer means and supported by said retainer means, each retainer means having a longitudinal opening to accommodate the insertion of a blanket portion into the hollow part of the retainer means for capture therein to anchor the blanket.

2. An insulation support system according to claim **1** wherein said retainer means each have a longitudinal slot facing said zone and defined by a pair of opposing lip parts.

3. An insulation support system according to claim **1** wherein said retainer means are supported by furnace walls in a predetermined spaced-apart relation to one another about the hot zone of the furnace.

4. An insulation support system according to claim **1** including a plurality of insulation blankets disposed in adjacent relation to one another with the edge portions of each adjoining pair of blankets being inserted into the slot of a common retainer means.

5. An insulation support system according to claim **1** including compressible insulation material compacted into the hollow parts of said retainer means to aid in anchoring said blanket portions therein.

6. An insulation support system according to claim **1** wherein said retainer means are disposed in parallel relation to one another and are approximately coextensive in length with a given boundary dimension of said zone.

7. An insulation support system according to claim **4** wherein said retainer means are disposed in staggered, parallel relation to one another.