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Sweet

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[54] **ADJUSTABLE ANCHOR DEVICE FOR FURNACE WALLS**

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[52] **U.S. Cl.** ..... **110/1 A,** 52/506, 122/6 A

[51] **Int. Cl.** **F23m 5/00**

[58] **Field of Search** ..... 110/1 R, 99 R; 52/249, 506, 712, 714, 378, 443, 444, 700, 701; 122/6 A

[56] **References Cited**

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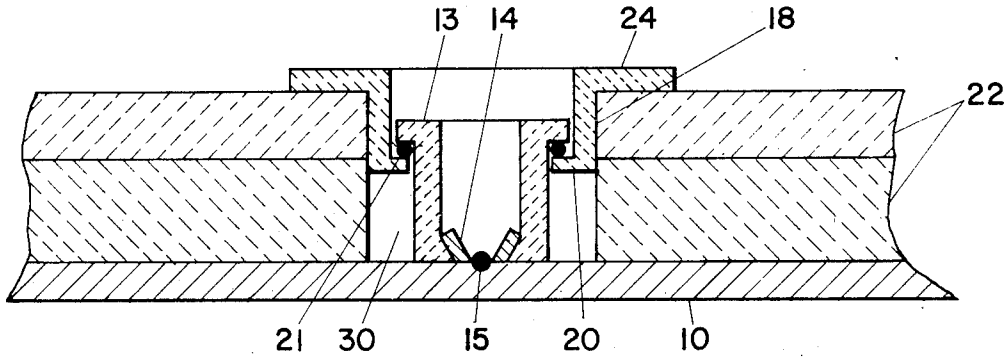
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Assistant Examiner—Larry I. Schwartz
Attorney—David E. Dougherty et al.

[57] **ABSTRACT**

An improved anchor device for securing refractory linings to furnace walls, the device comprising a ceramic holding cap enclosing an upper extension of a ceramic anchor attached to the furnace wall. The holding cap is slideably movable upon the ceramic anchor and may be adjusted to compensate for various thicknesses of lining materials and to compensate for dimensional changes in the lining materials during furnace operation.

7 Claims, 5 Drawing Figures



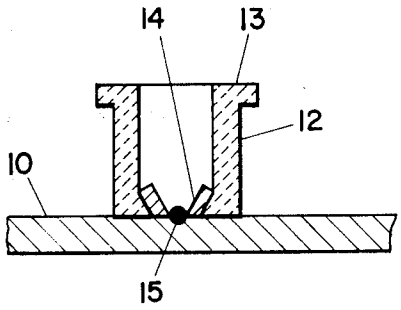


FIG. 1

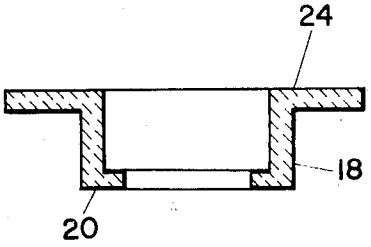


FIG. 2

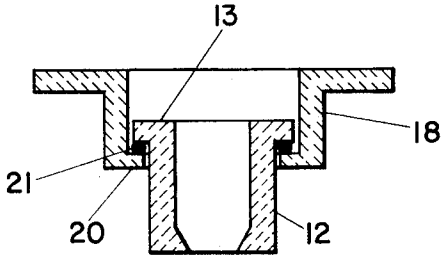


FIG. 3

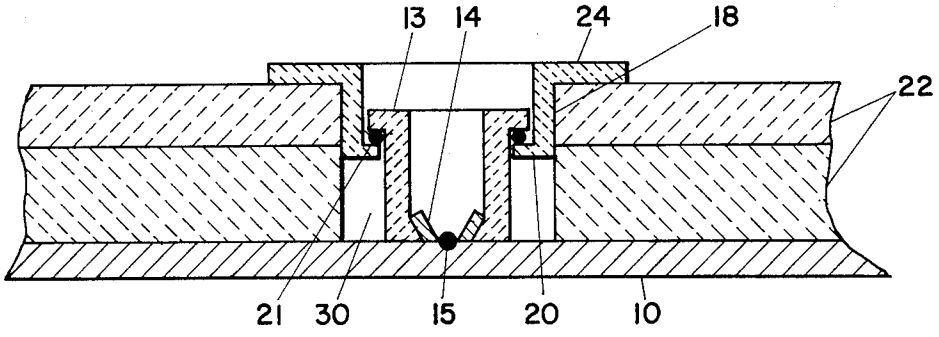


FIG. 4

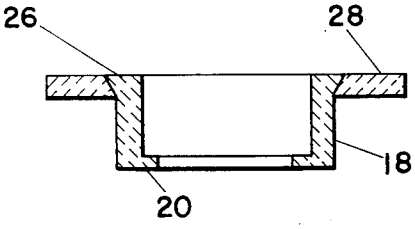


FIG. 5

ADJUSTABLE ANCHOR DEVICE FOR FURNACE WALLS

BACKGROUND OF THE INVENTION

This invention relates to the construction, especially the lining, of furnace walls and is particularly concerned with installations utilizing blankets, bats, or blocks of relatively lightweight refractory or heat insulating materials usable at relatively high temperatures.

Many methods and devices have been previously suggested for securing refractory and/or insulating materials as linings to the interior walls of a furnace. In many of such methods or devices the lining is required to have a specific shape or elaborate hardware on the furnace walls is required. In many instances an exorbitant amount of labor is necessary. Consequently, there has been a demand for a construction which permits the convenient attachment of refractory and/or insulating material in the form of blankets, sheets, bats, or blocks to furnace walls with a minimum of hardware and accessories and without exposing mounting hardware to furnace atmosphere and temperature.

A furnace wall construction as described in patent application Ser. No. 142,168, filed May 12, 1971, provides a simple and convenient method for lining furnace walls by securing blankets, sheets, blocks, or bats of suitable refractory and/or heat-insulating material on the walls, either in a single layer or in a plurality of layers. In constructing or installing the lining the securing or mounting means may be readily applied wherever necessary or desired, thus giving a flexibility to furnace wall construction which is absent in many prior systems.

Essentially the mounting or securing devices utilized in the method of this construction consist of tubular ceramic retaining members and small metal bushings. Each bushing is adapted to be secured to a metal wall surface and to so engage an associated one of the tubular ceramic retainers as to hold it against the wall surface. The metal bushings are placed inside the tubular ceramic members (hereinafter for convenience referred to as "anchors") the bushings and anchors having interengaging bevelled portions, and secured by suitable means, such as welding, to the metal furnace wall. The anchor is thus supported on the furnace wall, extending outwardly therefrom and having such external configuration as to engage the body of refractory and/or insulating material. The outer extensions of the anchors may have suitable flanges for engaging the outer face of the furnace lining material or the anchors may be shaped to engage refractory washers which in turn rest upon the outer face of the lining material. While this anchoring system as described has been quite successful, it has a disadvantage in that the lengths of the ceramic anchors cannot be readily adjusted to conform to varying thicknesses of lining material. Some types of fibrous lining material may be compressed to some degree during installation, but the denser types will not. This means the ceramic anchors used must have lengths closely matching the thickness of the lining materials used. Thicker liners will put a high mechanical strain on the anchors, while thinner liners will not be held tightly enough to avoid sagging and shifting. The furnace liners may also shrink during service and the ceramic anchors used cannot compensate for this. It is therefore desirable, in a system of this type, to provide an improved anchor which may be easily adapted to changes in the thickness of the lining materials and which can compensate to some degree for dimensional changes occuring in these materials during furnace operations.

SUMMARY OF THE INVENTION

The invention provides an improved ceramic anchor device which comprises a ceramic holding cap which surrounds an outer extension of a ceramic anchor and is slideably moveable thereon. The ceramic holding cap may have an outwardly extending flange at its upper end for engagement with the outer face of a furnace lining material. The holding cap may alternatively engage a washer of ceramic material which holds the outer face of the lining material. The overall length of the ceramic anchor and holding cap may be adjusted by applying one or more rings or gaskets of compressible refractory fibrous material around the outer extension of the anchor, before it is surrounded by the ceramic holding cap, these rings allowing not only adjustment of the overall length of the anchor device, but also a continuing pressure of the holding cap against the lining material, due to the elasticity of the fibrous rings.

DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a ceramic anchor in place on a furnace wall and fastened to the wall by an internal metal bushing.

FIG. **2** shows the improved ceramic holding cap.

FIG. **3** shows the improved ceramic holding cap in position upon the ceramic anchor of FIG. **1** to give an adjustable anchor device.

FIG. **4** shows the holding action of the adjustable anchor device upon a body of lining material.

FIG. **5** shows an alternate holding cap construction, using a separable ceramic washer as a holding surface.

DESCRIPTION OF THE INVENTION

This invention is an improvement over a method described in patent application, Ser. No. 142,168, filed May 12, 1971, for securing lining materials, such as refractory or ceramic insulation panels, to metal furnace walls. In this method, suitable holes are cut in the lining material and cylindrical ceramic anchors are then positioned in these holes and fastened to the underlying furnace wall by welding or otherwise securing suitable metal bushings inserted within the ceramic anchor. This method is generally indicated in FIG. **1** where the underlying metal furnace wall is shown at **10** and the ceramic anchor **12** is fastened to the wall by means of a conical metal bushing **14** which firmly wedges into a correspondingly shaped surface inside the anchor **12.** The bushing **14** is fastened to wall **10** by welding at **15.** In an alternate method, the bushing may be threaded for engagement with a matching threaded short stud fastened at **10.** The ceramic anchor **12** has, at its upper extension, a radial flange extending outwardly at **13.** The improved anchor device comprises a ceramic holding cap **18,** as shown in FIG. **2** in combination with the ceramic anchor as shown in FIG. **1.** At the lower end, the cap **18** has a radial flange **20,** extending inwardly, with an inside opening having a diameter slightly larger then the outside diameter of the ceramic anchor **12,** shown in FIG. **1.** The improved device is shown in FIG. **3** where the ceramic cap **18** is shown assembled in a sliding relationship with the upper extension of the ceramic anchor **12.** The overall length of the attachment

device may be readily adjusted by placing one or more rings or gaskets of flexible refractory material **21** around ceramic anchor **12** before the addition of the ceramic holding cap **18**. In FIG. **4**, the anchor device is shown attached to the underlying furnace wall **10**, with the holding cap **18** securing layers of lining material **22**. The outer end of the cap has an integral outwardly extending annular flange **24** which engages the outer face of the lining material.

An alternate construction for the holding cap **18** is shown in FIG. **5** in which the cap **18** has an outardly sloping exterior bevel surface at **26**, whereby a separate ceramic washer **28** is engaged by a matching bevel surface on the center opening of the washer.

The overall length of the improved anchor device may be easily adjusted to fit various thicknesses of lining materials by adding rings or gaskets of resilient fibrous material around the upper extension of the ceramic anchor, as shown in FIGS. **3** and **4**. The fibrous material **21** may be in the form of a braid or rope and may comprise refractory fibers such as those of aluminum silicate, alumina, silica, zirconia, boron carbide, silicon carbide and the like. The material should have sufficient resiliency to exert a compressive effect upon the lining materials when the attachment device is installed. This effect tends to compensate for dimensional changes in the lining during furnace operation and provides an automatic compensation for variations in lining thickness, both before and during furnace operation.

A further advantage of the improved attachment device is in the use of a standard, relatively short, ceramic anchor, as shown in FIG. **1**. This type of ceramic anchor can now be used in many different types of applications, the shorter length making installation easier. While the same refractory may be used for both the ceramic anchor and the holding cap, this is not essential to the invention and the holding cap may be made of a more heat resistant refractory, if desired. The open center portions of both the ceramic anchor and the holding cap are preferably packed with bulk ceramic fiber to reduce heat transfer and protect the metal bushing **14** (FIG. **1** and **4**) against the furnace heat. Refractory caps or castable mixes would not be satisfactory for this purpose since they would probably interfere with the adjustable action of the anchor device. For additional insulation, the annular open space **30** (FIG. **4**) below the holding cap base is also filled with a cylinder of light weight compressible refractory fiber, preferably an aluminum silicate fiber.

The anchor device of the invention is assembled by sliding the ceramic holding cap **18**, shown in FIG. **2** over the ceramic anchor **12**, the flange **20** of the holding cap being retained by the flange **13** of the ceramic anchor. One or more rings of compressible fibrous refractory material **21** are preferably placed around the outer extension of the ceramic anchor **12** before the addition of the ceramic holding cap **18**. This preferred assembly is shown in FIG. **3**. The assembled anchor device is then inserted through a suitable opening in the body of furnace lining material and the ceramic anchor fastened to the furnace shell by a metal insert **14**, secured to the shell, preferably by welding, as shown in FIG. **4**. A small cylinder of compressible refractory fibrous insulation may be placed around the ceramic anchor before it is fastened in place and the hollow interiors of both anchor and holding cap may be filled with a similar insulation to reduce heat loss.

What is claimed is:

1. In a furnace wall having a metal surface; a furnace lining material on said surface, said lining material having an inner face adjacent said surface and an outer face, a tubular ceramic anchor fastened to the surface and extending through the lining material to secure it to said surface; the improvement comprising a ceramic holding cap surrounding an outer extension of the ceramic anchor and slideably movable thereon, said holding cap having means for engaging the outer face of the lining material and means for adjusting the holding force applied to the outer face of the lining material.

2. A furnace wall according to claim **1** in which the engaging means comprises an outwardly extending radial flange.

3. A furnace wall according to claim **1** in which the engaging means comprises a washer of ceramic material.

4. A furnace wall according to claim **1** in which the adjusting means comprises at least one ring of compressible fibrous refractory material.

5. A furnace wall according to claim **4** in which the refractory fibrous material is selected from the group consisting of aluminum silicate, alumina, silica, zirconia, boron carbide and silicon carbide.

6. A method of installing a lining on a metal furnace wall which comprises;

a. providing a body of furnace lining material, the body having an inner face and an outer face;
b. forming an opening through said body;
c. inserting into said opening from the outer face of said body a tubular ceramic anchor, said anchor having a slideably movable ceramic holding cap surrounding an outer extension of the anchor, the holding cap engaging the outer face of the body;
d. inserting a metal bushing into said anchor; and
e. securing said metal bushing to the metal funace wall, the bushing engaging with an inner extension of the anchor to hold the anchor against the furnace wall.

7. A method of installing a lining on a metal furnace wall according to claim **6** in which the method further comprises:

f. forming at least one ring of compressible fibrous refractory material around the outer extension of the anchor; and
g. inserting the anchor within the movable ceramic holding cap before the insertion of the anchor into the opening in the body of lining material at step (c).

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