United States Patent

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[54] **MODULARIZED FURNACE ENCLOSURE**
6 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **122/6,** 122/494, 122/510
[51] **Int. Cl.** **F22b 37/24**
[50] **Field of Search** 122/6, 240, 478, 494, 510, 235

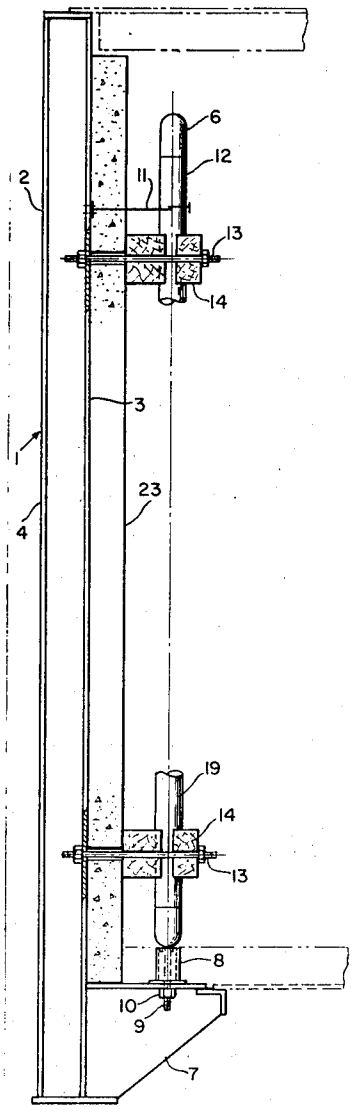
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ABSTRACT: This disclosure teaches a method and related apparatus for subassembling a furnace enclosure. Modules are prepared which include panels complete with tube supports, coils and refractory. These panels are rectangular with flanges along opposite sides which flanges are formed by bending the panels. Modules are assembled to describe the furnace enclosure with a polygonal plan section (preferably a regular octagon). Adjacent panels are joined along corners by means of the flanges.



Patented Sept. 29, 1970

3,530,835

Sheet 1 of 2

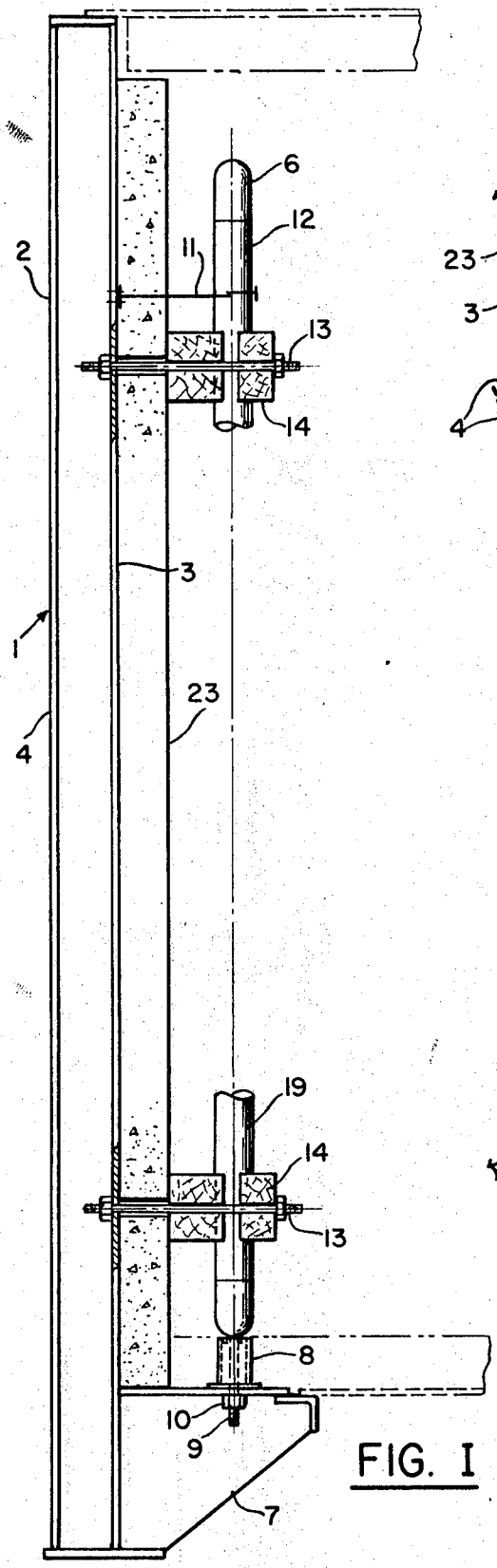


FIG. I

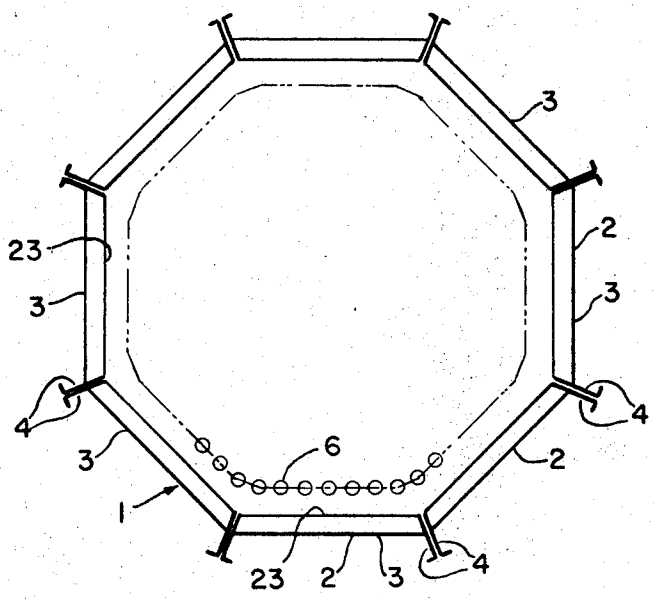


FIG. III

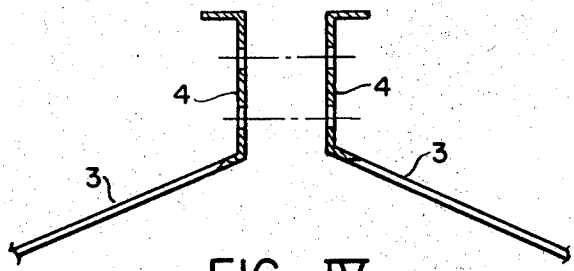


FIG. IV

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Patented Sept. 29, 1970

3,530,835

Sheet 2 of 2

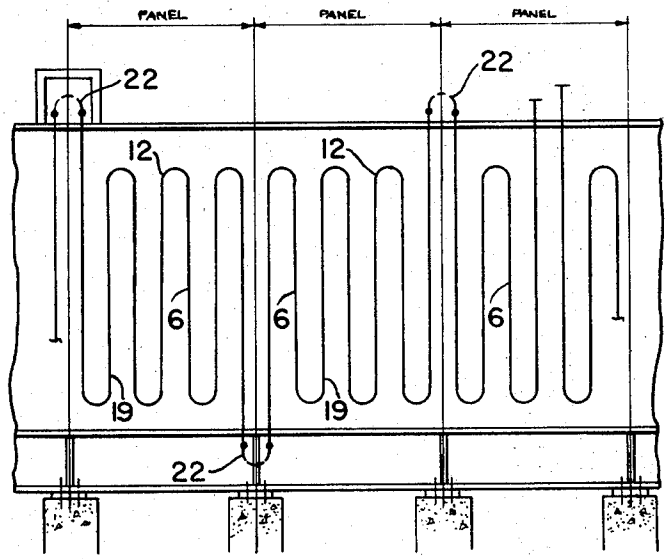


FIG. V

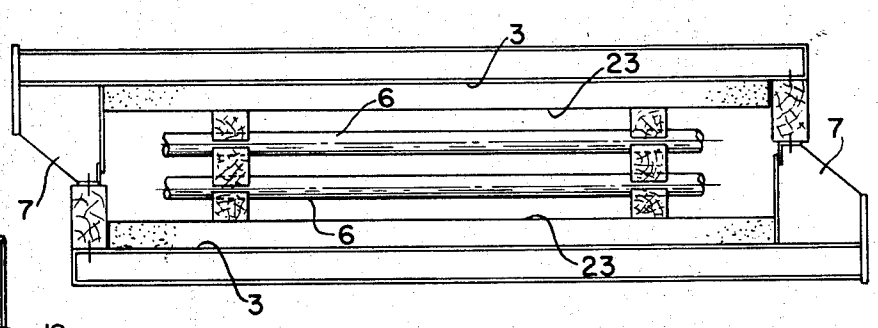


FIG. VI

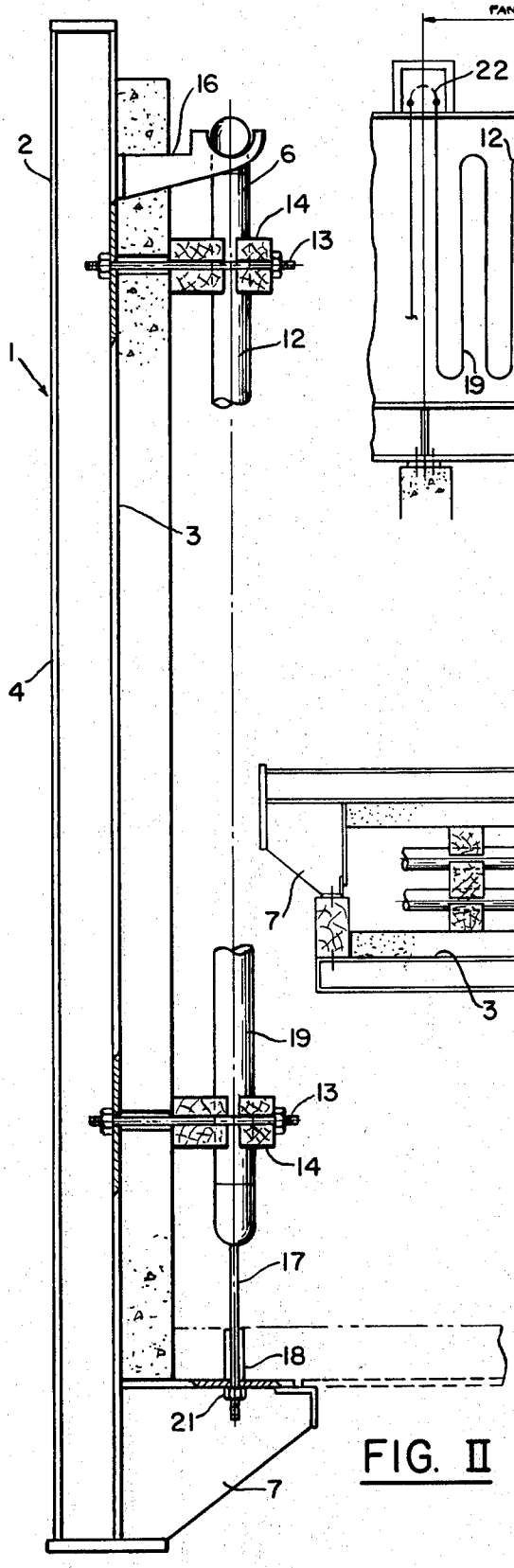


FIG. II

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MODULARIZED FURNACE ENCLOSURE

BACKGROUND

Manufacture in shops of furnaces offers ease, economy, manufacturing quality and rapid assembly. But in many instances, transportation clearances limit and frustrate this approach to furnace manufacture. Stacks, convection sections and furnace enclosures are regularly subassembled. The stacks and convection sections present little difficulty, but furnace enclosures do pose a problem. Flame impingement on tubes is harmful and dangerous, so space is necessary to assure adequate release of fuel energy; accordingly, design of furnace geometry becomes severely limited by flame patterns. A further design consideration is that for efficient overall heat transfer, sufficient radiant tube surface must be made available. By way of summary, the problem at the heart of shop assembly for furnace enclosures has been to fit sufficient surface in space dictated by flame patterns and to provide sufficient radiant tube surface while simultaneously complying with transportation clearances. In the past if these limiting conditions were not satisfied simultaneously, the usual choice was to abandon shop fabrication as an alternative in favor of assembling the furnace enclosure in the field from elemental components such as hair-pinned tubes, tube supports, panels and structural steel with refractory linings likewise installed in the field.

SUMMARY

Mr. Von Wiesenthal's present teaching achieves important benefits of shop assembling a furnace enclosure, while also making it possible to satisfy transportation clearances. The furnace enclosure is made up in modules which include panels complete with tube supports, coils and refractory. Structural interconnection is also provided for in the panelling. Panels are rectangular with flanges along opposite sides which flanges preferably are formed by bending the panels. Usually the panels can be planar (although they might be arcuate). In the field the panels are assembled to describe the furnace with a polygonal plane section (preferably a regular octagon). Adjacent panels are joined along corners by means of the flanges.

The basic objective of this invention is to increase the size of furnace enclosures which can be shop assembled.

A further objective is to reduce the amount of field labor necessary in erection of the furnace enclosures.

A further objective is to offer greater flexibility in furnace design.

A further objective is to present a furnace enclosure which is convenient to manufacture and which is otherwise well suited to its intended function.

DRAWINGS

The foregoing and other objectives will be seen more fully from the accompanying drawings wherein:

FIG. I is a fragmented vertical elevation of a module according to the present invention wherein the tubes are bottom supported.

FIG. II is a fragmented vertical elevation view comparable to FIG. I except that the tubes are top supported.

FIG. III is a plan section illustrating an assembled furnace enclosure in an octagonal configuration which represents the most preferred embodiment from structural geometric points of view.

FIG. IV is an exploded detail depicting a joint formed by adjacent flanges.

FIG. V is an idealized sketch showing the coil unfolded from about its polygonal configuration.

FIG. VI indicates a preferred technique for shipping pairs of panels whereby the panels form a box to protect coils and refractory.

PREFERRED EMBODIMENTS

As best seen in FIG. III, furnace enclosure 1 according to this invention is assembled from a plurality of modules 2 which include panels 3 and can be connected by flanges 4 to define a polygonal plan section.

In shop fabricating these modules as seen in FIG. IV, flanges 4 are best formed by bending panels 3. Flanges 4 offer structural rigidity and provide convenient means for integrating modules 2 in the assembly of furnace enclosure 1. This assembly is first made up in the shop and match marks are applied for ease of reassembly in the field. Field assembly is best accomplished by stud welding or by conventional bolting in followed by welding.

At the core of this invention is assembly of as much of the furnace enclosure in modules as is possible. With reference to FIG. I, coil element 6 can be supported from modules 2 by means of bottom bracket 7, sleeve 8, bolt 9 and nut 10. Top guide 11 aligns upper end 12 of the coil elements and spacer bolts 13 bear on wooden blocks 14 to maintain coil elements 6 in place during shipment. As shown in FIG. II, coil elements 6 could also be positioned by means of tube hanger 16. In FIG. II a stem 17 and sleeve 18 bottom alignment arrangements would also be shop installed for positioning lower ends 19 of the coil elements (with nut 21 to be removed after erection). As in FIG. I, spacer bolts 13 and wooden blocks 14 would also be employed. As best seen from FIG. V, crossovers 22 would be positioned out of furnace enclosure 1 so that field welding would not be sensitive.

A convenient technique for shipping modules 2 is to assemble them by pairs in head-to-toe reverse relationship with interior sides 23 facing each other as shown in FIG. VI.

It will be apparent to those skilled in furnace design and/or shop fabrication that various deviations may be made from the preferred embodiment here set forth without departing from the spirit of invention as set forth in the following claims.

I claim:

1. A furnace enclosure with a vertical approaching cylindrical form and assembled from at least five subassembled panels each comprising in combination:
- a rectangular coplanar plate having an inward side as well as two opposed margins each provided with an extension of the plate bent into a continuous L-shaped web and flange assembly projecting outward and backward;
- refractory lining the inward side of each plate;
- at least one furnace coil element depending from and inward of each plate;
- the panels assemblable margin to margin to describe the vertical approaching cylindrical furnace enclosure with a polygonal plan section;
- adjacent panels joined along the corners of the polygon with their webs abutting back to back and their flanges projecting rearwardly therefrom to form conjointly an outwardly projecting T-shaped section;
- the T-shaped section connected to a foundation for transmitting loads of and on the furnace enclosure thereto; and
- means for integrating the furnace coil elements.

2. The furnace enclosure according to claim 1 with the plates dimensioned so that the polygon is regular.

3. The furnace enclosure according to claim 2 with the polygon having eight sides.

4. A method for assembling a furnace enclosure to have a vertical approaching cylindrical form and comprising the steps of:
- providing at least five subassembled panels each comprising a rectangular coplanar plate having an inward side as well as two opposed margins;
- bending an extension of the plate at each of the margins to form an L-shaped web and flange assembly projecting outward and backward;
- lining the inward side of each panel with refractory;
- mounting at least one furnace coil element on and inward of each panel;
- assembling the panels margin to margin to describe the vertical approaching cylindrical furnace enclosure with a polygonal plan section;

joining adjacent panels along the corners of the polygon with their webs abutting back to back and their flanges projecting rearwardly therefrom to form conjointly an outward projecting T-shaped section;

connecting the T-shaped section to a foundation for transmitting loads of and on the furnace enclosure thereto; and

integrating the furnace coil elements.

5. The method according to claim 4 with the plates dimensioned so that the polygon is regular.

6. The method according to claim 5 with the polygon having eight sides.