United States Patent [19]

Roberts, Jr. et al.

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[54] **METHOD OF ERECTION OF HORIZONTAL SURFACED HEAT TRANSFER MODULES FOR STEAM GENERATING UNITS**

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[21] Appl. No.: **155,460**

[52] **U.S. Cl.** **29/157.4**, 29/429, 29/469

[51] **Int. Cl.** **B23p 15/26**, B23p 19/00

[58] **Field of Search** ..... 29/157 R, 157.3 R, 29/157.4, 469, 429

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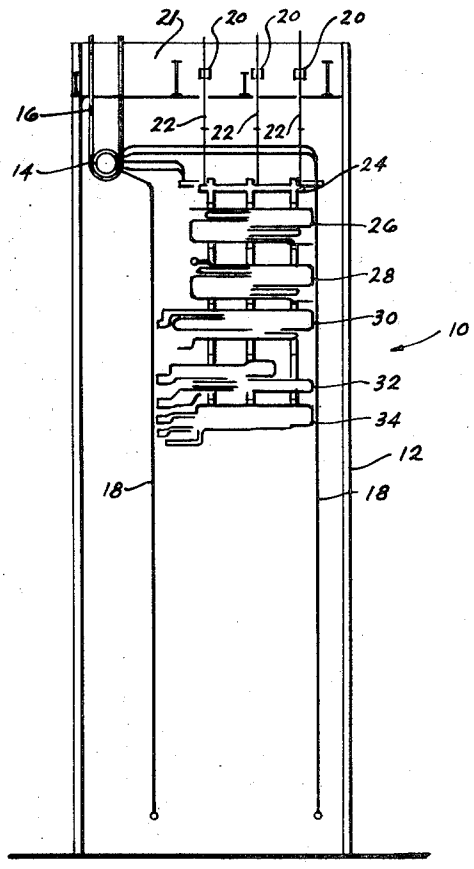
[57] **ABSTRACT**

A method of erection of heat transfer module sections for horizontal surfaced steam generating units wherein hydraulically operated jacks are placed on the overhead structure in the permanent hanger line. Threaded rods extend through the jacks to the grade elevation where they are attached to the permanent hanger system. The heat transfer modules which may be superheater, reheater or economizer sections are individually brought into the furnace cavity and put together at grade elevation raising each module just high enough to bring in the next module for connection to the preceding module until the total surface is assembled. The jacks are then run up to the fully erected position for the total surface arrangement and the permanent hanger system installed to the furnace structural support.

3 Claims, 5 Drawing Figures



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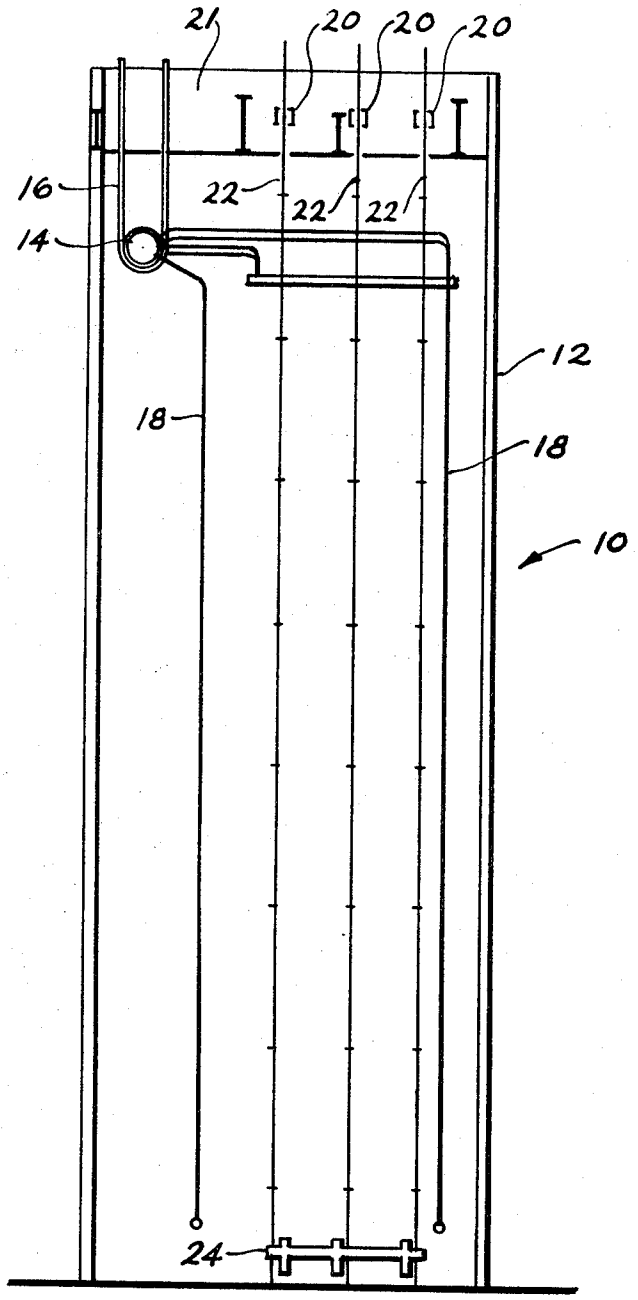

FIG-1

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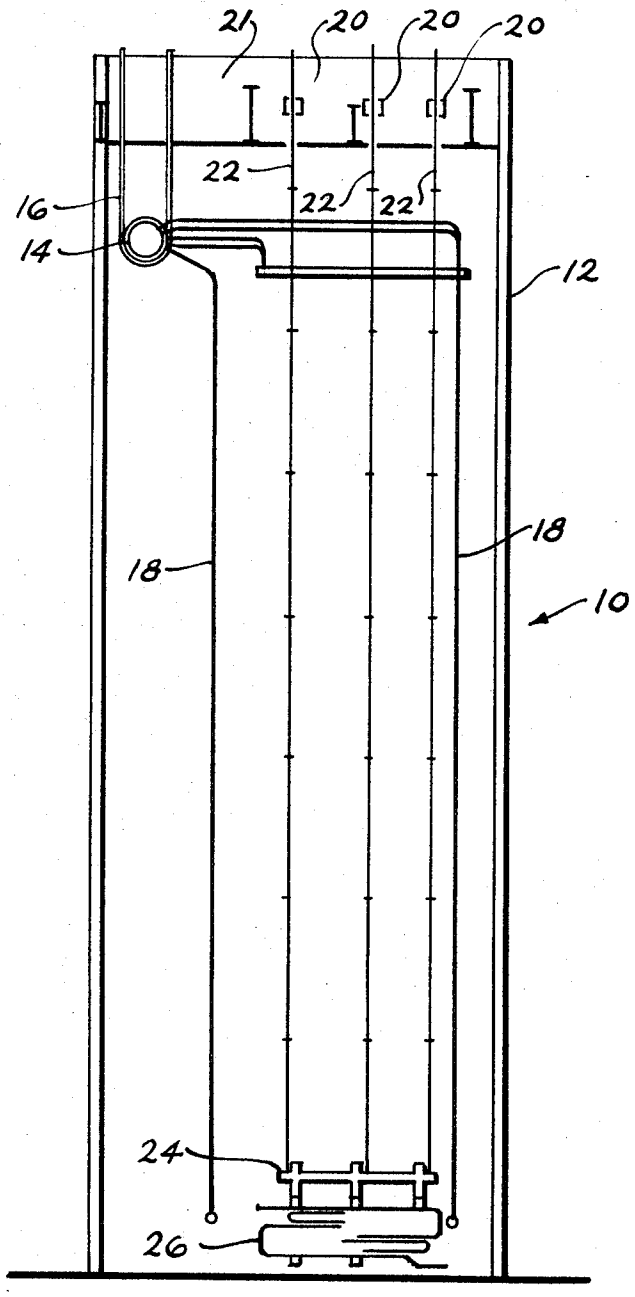

FIG. 2

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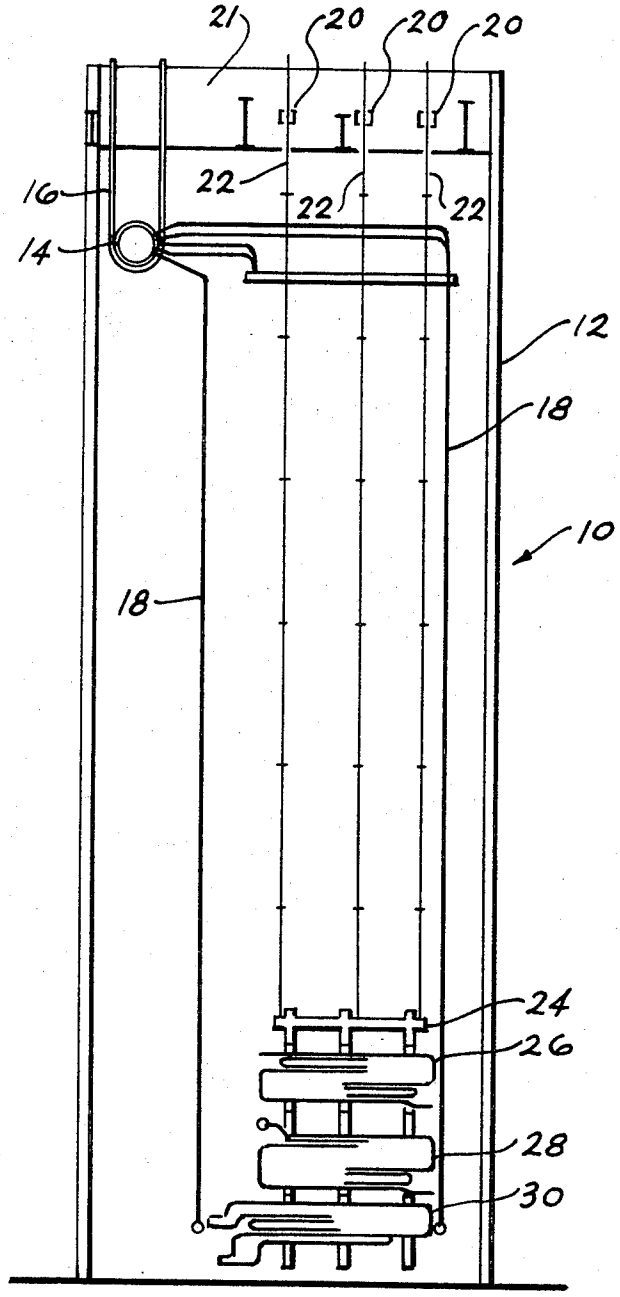

FIG - 3

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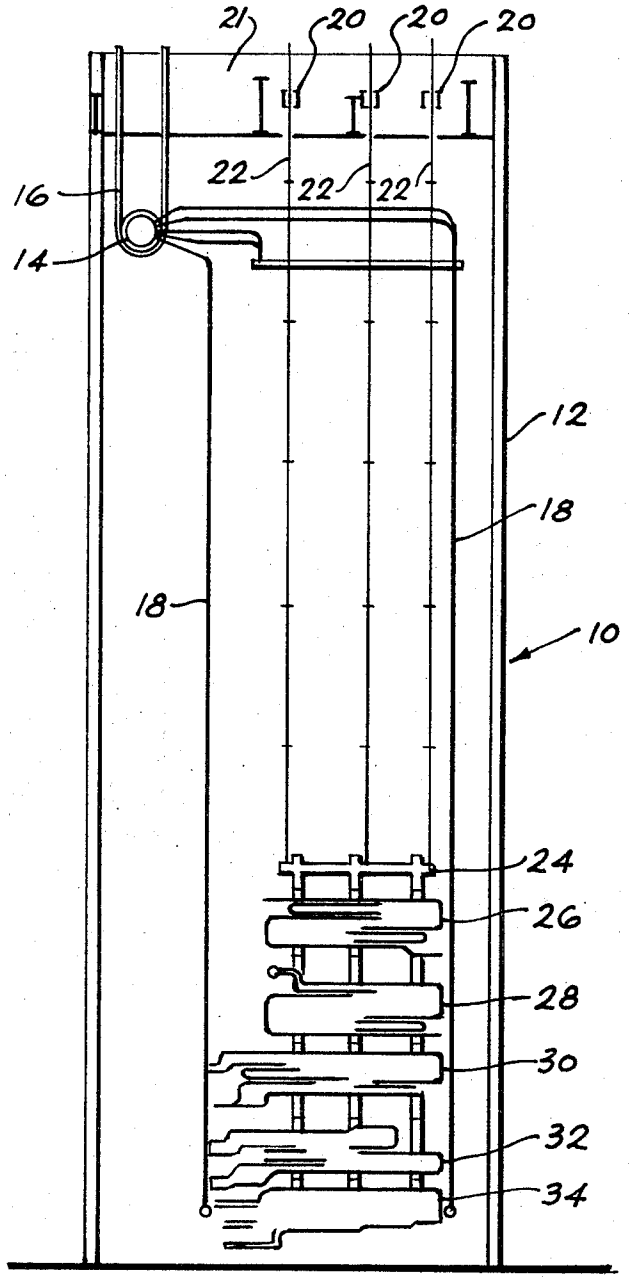

FIG-4

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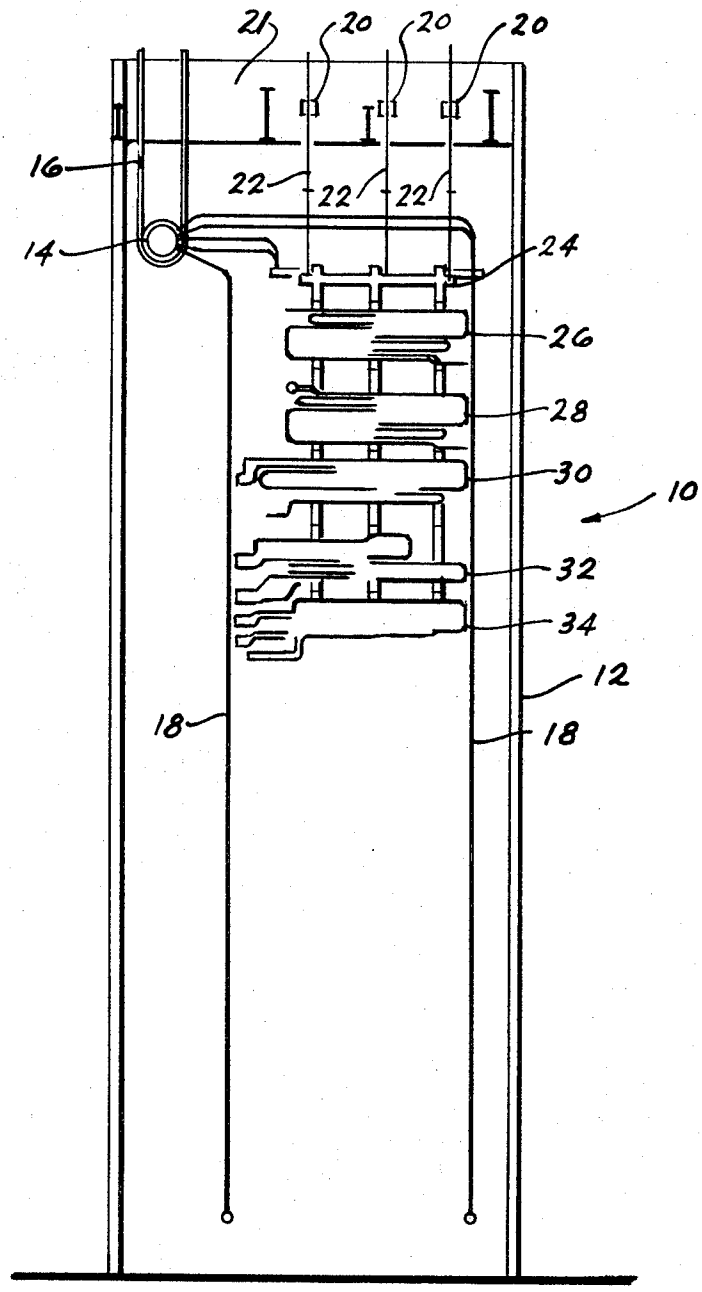

FIG. 5

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METHOD OF ERECTION OF HORIZONTAL SURFACED HEAT TRANSFER MODULES FOR STEAM GENERATING UNITS

BACKGROUND OF THE INVENTION

In the manufacture of steam generating units for utility power plants and large industrial facilities, it has long been sought to bring at least some phases of the boiler fabrication into the shop, as opposed to the past practice or using full field erection techniques. As is well known, the transportation of erection equipment to the field and the dependence upon a transient labor market of inconsistent quality adds considerably to the cost of field erection. By standardizing components wherever possible, shop fabrication of boiler element modules can be accomplished to maintain more accurate control over manufacturing techniques as well as to provide overall cost reduction by eliminating a substantial portion of the field erection procedures. Recently there has been a trend to modularizing the heat transfer surfaces of the steam generating units. This procedure greatly reduces the number of welds necessary to be accomplished in the field as well as insuring proper alignment of the water tubes which make up the surface without using field equipment.

SUMMARY OF THE INVENTION

There is herein provided a field erection technique for assembly of heat transfer surface sections steam generating units utilizing horizontal surfaced heat transfer sections which permits the use of shop assembled heat transfer modules. Hydraulically operated jacks are placed on the overhead structure in the permanent hanger line. Rods extend through the jacks to the grade elevation where they are attached to the permanent hanger system. The heat transfer modules which may be superheater, reheater, or economizer sections are individually brought into the furnace cavity and put together at grade elevation raising each module just high enough to permit the next module to be brought in for connection to the preceding module until the total surface is assembled. The jacks are then run up to the fully erected position for the total surface arrangement and the permanent hanger system installed to the furnace structural support.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of a steam generating unit furnace cavity having hydraulic jacks and rods in place and attached to the permanent hanger system.

FIG. 2 is a side elevation of the furnace cavity of FIG. 1, further having the first heat transfer surface module attached to the permanent hanger system.

FIG. 3 is a side elevation of the furnace cavity of FIG. 1, further having three modules attached to the permanent hanger system.

FIG. 4 is a side elevation of the furnace cavity of FIG. 1, further having the completed horizontal heat transfer surface arrangement attached to the permanent hanger system.

FIG. 5 is a side elevation of the furnace cavity of FIG. 1, further having the completed horizontal heat transfer surface arrangement raised to its fully erected position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, the FIGS. 1 - 5 show in sequence the novel assembly technique for erection horizontal surface heat transfer sections for a steam generating unit 10 according to the present invention. The steam generating unit 10 is comprised of superstructure 12 in which is mounted a steam drum 14 supported by U-shaped hangers 16 (one shown). Within the furnace cavity of the superstructure 12, vertical furnace waterwalls 18 are positioned and tied into the steam drum 14 in a standard flow arrangement. In order to accomplish the novel heat transfer surface erection, there are supported on the overhead structure 21 of the superstructure 12 a series of hydraulically operated jacks 20 through which segmented rods 22 extend. The number of jacks 20 is dependent upon the heat transfer surfaces to be positioned in the steam generating unit 10 and their particular array.

At the grade elevation, the threaded rods are attached to the permanent hanger system 24 (FIG. 1). The jacks are then run up just high enough to bring the first horizontal surface unit 26 beneath the permanent hanger system 24. The first horizontal unit 26 may be any particular modularized section of horizontal heat transfer surface such as a superheater section, reheater section or economizer section depending upon the particular design of the steam generating unit being erected. Unit 26 (see FIG. 2) is then welded to the hanger system 24, this welding, of course, being more readily accomplished at the grade level than when attempted at the upper elevations as in the procedures heretofore utilized.

After the first horizontal surface unit 26 is connected to the permanent hanger system 24, the hydraulic jacks 20 are run up just far enough to permit the assembly of successive individual horizontal surface modules 28, 30, 32 and 34 (see FIGS. 3 and 4). Selection of the modules and their order of erection dependent upon the design criteria of the particular steam generating unit being erected. At this point, with the complete horizontal heat transfer surface arrangement for the steam generating unit 10 being properly assembled, the hydraulic jacks 20 are run up to the point where the permanent hanger system 24 can be installed at its proper elevation to the furnace structural support 12. It is understood that due to the segmented nature of the threaded rods 22, the rods may be disassembled once they have passed through the hydraulic jacks 20.

From the foregoing it is readily apparent that there is herein provided a novel assembly technique for the erection of horizontal surface heat transfer sections of large steam generating units. The horizontal surface sections for the steam generating unit are constructed as modules and are connected into the steam generating unit at the grade level by the use of a hydraulic jack and threaded rod system. Each module in turn is brought into the furnace cavity at the grade level and attached to the immediately preceding module, after which the hydraulic jack system raises the assembled modules within the cavity a distance so as to permit the insertion therein of the next module to be joined to the combination. After all the modules are assembled to form the complete heat transfer surface arrangement, the hydraulic jacks will raise the entire arrangement to its permanent level within the furnace structure and

permanent fixture at that point may be accomplished. All tubular connection welds are thus made at the grade elevational level so that support of the horizontal surface units is not needed during the welding procedure and the welding procedure is accomplished at a more convenient working level.

While this preferred embodiment of the invention has been shown and described, it will be understood that it is merely illustrative and that changes may be made without departing from the scope of the invention as claimed.

What is claimed is:

1. A method of erection of heat transfer module sections for a horizontal surface steam generating unit having an overhead structure in a permanent hanger line, a furnace cavity, and a grade elevation comprising the steps of: supporting a selected jacking system on the overhead structure of the steam generating unit; extending rods through said jacking system into the furnace cavity of the unit to the grade elevation thereof; attaching the permanent hanger system to the rods at grade elevation; actuating said jacking system to raise said rods and said permanent hanger system to only a height sufficient to permit insertion of a horizontal surfaced heat transfer module into the furnace cavity; inserting said horizontal surfaced heat transfer module into said furnace cavity at grade level and fixing said module to said permanent hanger system; building up the remainder of the heat transfer surface by actuating said jacking system to raise the combined assembled structure to only a height sufficient to permit the insertion of each next horizontal surfaced heat transfer module into the furnace cavity, inserting in turn each of said horizontal surfaced heat transfer modules into said furnace cavity at grade level, and fixing each of said modules to the preceding module until the total heat transfer surface is assembled; actuating said jacking system to run said total assembled horizontal heat transfer surface to its fully erected height within said furnace cavity, and permanently fixing said horizontal heat transfer surface to said furnace structure at said fully erected height.

2. The method of claim 1 wherein selection of said jacking system is accomplished so as to provide a series of hydraulic jacks, the number and positioning thereof being dependent upon the particular horizontal heat transfer surface configuration to be erected.

3. The method of claim 1 wherein the elements of the assembled horizontal heat transfer surface are selected in proper order from superheater modules, reheater modules or economizer modules depending upon the particular heat transfer surface configurations desired for the steam generating unit.

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