Dec. 30, 1969 P. FREUND 3,486,986

SELF-SEALING COKE OVEN DOOR CONSTRUCTION

Filed Aug. 18, 1965 2 Sheets-Sheet 1

FIG. 1.

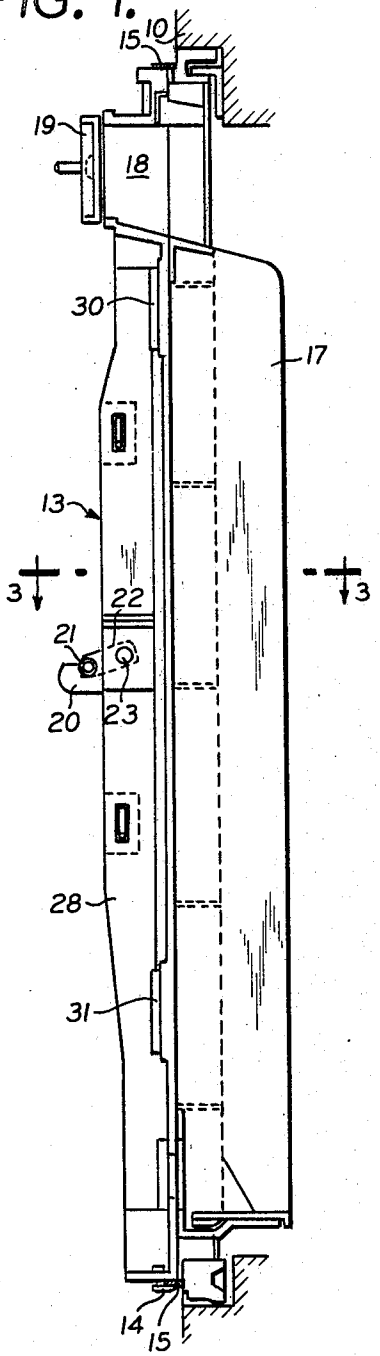


FIG. 2.

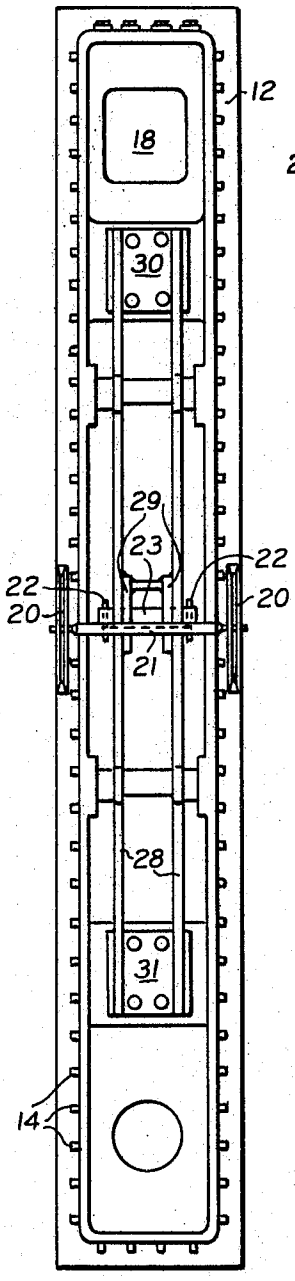


FIG. 3.

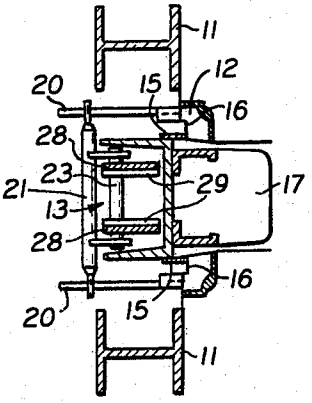


FIG. 4.

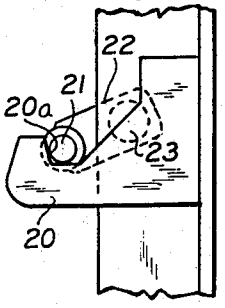
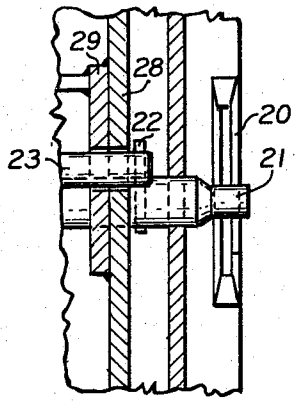


FIG. 5.



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SELF-SEALING COKE OVEN DOOR CONSTRUCTION

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FIG. 6.

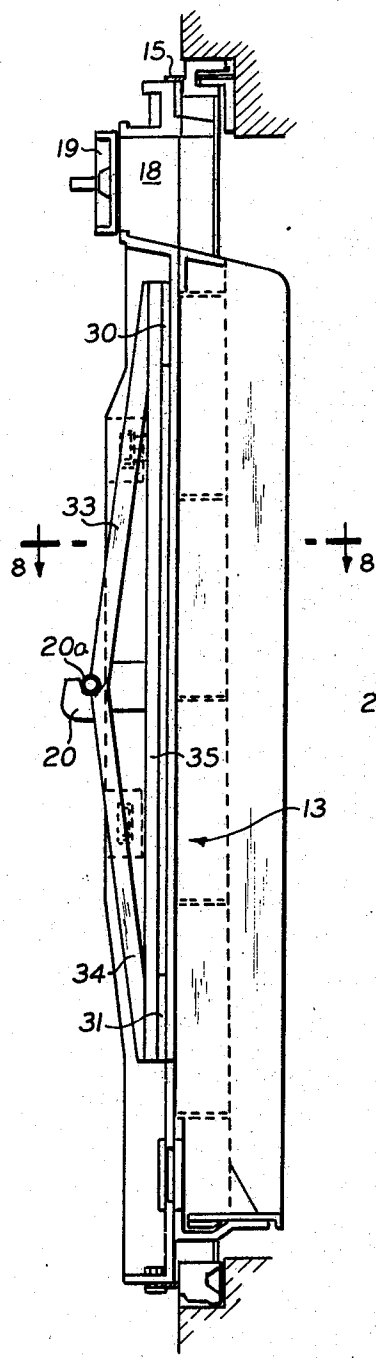


FIG. 7.

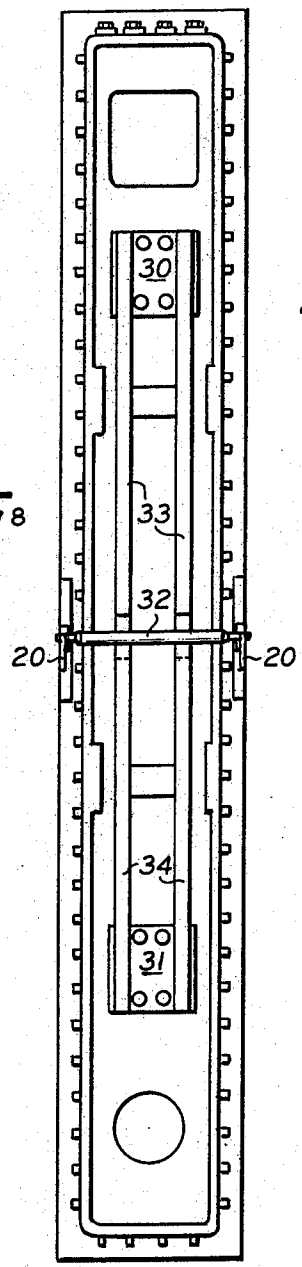


FIG. 8.

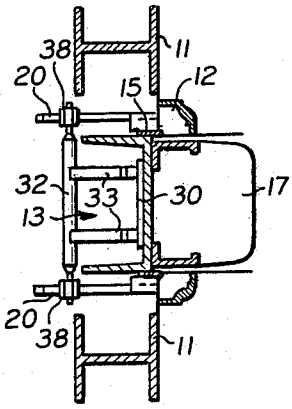


FIG. 9.

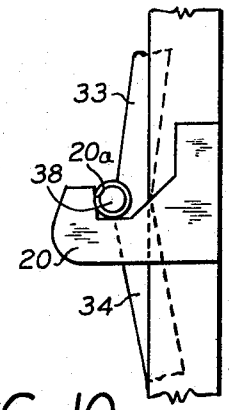
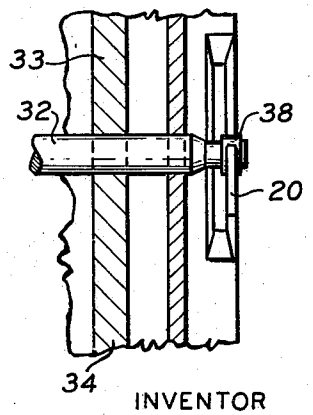


FIG. 10.



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SELF-SEALING COKE OVEN DOOR CONSTRUCTION

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Int. Cl. C10b 25/06
U.S. Cl. 202—248 1 Claim

ABSTRACT OF THE DISCLOSURE

A self-sealing coke oven door has one pair of spaced hooks fixed to the frame of the door. The hooks are formed with cam surfaces inclined so that the lower ends of the cam surfaces are closest to the door opening. Cam following members are provided to ride on these cam surfaces so that as the door is positioned over the opening, the relative movement between the cam following members and cam surfaces will pull the door against the door opening. Load distributing means are formed on the door to transmit the force between the cam following means and the cam surfaces to spaced points on the door.

This invention relates to the art of coke oven doors, more particularly to an improved self-sealing door construction facilitating the attainment of necessary sealing pressures between the door and door opening as the door is positioned to close off a coke oven.

A variety of so-called "self-sealing" door constructions have been evolved for use in connection with coke ovens so that upon positioning of the coke oven door in a closure position with respect to the door opening, the weight of the door will act to force the door into a sealed position with respect to the door opening. Coke ovens, particularly coke ovens of the horizontal type are provided with a door opening extending in a vertical plane. A sealing element in the form of a metallic sealing edge, or asbestos rope, is positioned between the door opening and the door so that when the door is brought into closure position with respect to the door opening, the sealing elements are engaged to effect desired sealing of the spaces between the door and the door opening. Pressure must be exerted on the door to insure the desired engagement of the sealing means.

Prior art self-sealing doors have employed a plurality of pairs of hooks with angled cam surfaces cooperating with cam followers to draw the door against the door opening to insure desired pressure. In these prior art doors, the hooks are arranged at different height levels on the door so as to guarantee a relatively uniform contact pressure on the sealing means, and pressure equalizing linkage bars are arranged between the cam followers mounted on the door so as to compensate for pressure differentials arising due to thermal expansion of the door and door frame during operation of the coke oven. This use of a plurality of pairs of cam surfaced hooks, along with the cam followers interconnected by pressure equalizing linkage bars, produce a rather costly and complex structure in which the positioning of the door in a closure orientation requires rather careful manipulation to insure the engagement of all of the separate pairs of hooks by the separate cam followers.

It is with the above problems and desiderata in mind that the present improved means have been evolved for urging a door into closure position with respect to a door opening. The improved means of the instant invention require engagement of a cam surface along only a single line, thus implementing the facility with which the door may be positioned over a door opening, and further provide for distribution of sealing pressures in a uniform fashion over the height of the door.

It is accordingly among the primary objects of this invention to provide improved means for urging a door into closure position with respect to a door opening.

A further object of the invention is to provide a coke oven door with means urging the door against a vertical oven opening with said means subject to simple engagement as the door is moved towards the opening.

Another object of the invention is to provide a horizontal coke oven with a self sealing door utilizing only a single pair of hooks and rollers between the door and door opening, thereby simplifying the construction of the door, and minimizing manipulative steps required in positioning of the door in a closure orientation.

A further object of the invention is to provide simple load distributing means for the securing means of a self sealing door of a horizontal coke oven without requiring the use of pressure equalizing linkage rods or the like.

These and other objects of the invention, which will become hereafter apparent, are achieved by providing a door of the self sealing type with a single pair of hooks arranged between the door and the opening. The hooks are formed with cam surfaces inclined so that the lower ends of the cam surfaces are closest to the door opening. Cam following members are provided to ride on these cam surfaces so that as the door is positioned over the opening, the relative movement between the cam following members and the cam surfaces will pull the door against the door opening. In order to insure the relatively uniform distribution of forces over the door, load distributing means are formed on the door to transmit the forces between the cam following means and cam surfaces to spaced points on the door.

Among the features of the invention is the fact that the cam followers are formed as rollers arranged for rotation about a single pivot axis so that the positioning of the door merely requires orientation of this single pivot axis, as opposed to the plurality of axes whose orientation had to be controlled in prior art developments.

Another feature of the invention resides in the mounting of the cam following rollers on load distributing struts which serves the two-fold function of reinforcing the door and distributing the sealing pressures uniformly.

The specific details of one or more embodiments of the invention, and their mode of functioning, will be made most manifest and particularly pointed out in clear, concise and exact terms in conjunction with the accompanying drawings, wherein:

FIG. 1 represents a view in vertical section of an oven door and the adjacent parts of the brickwork in a vertical plane lying on the axis of a typical horizontal coke oven chamber;

FIG. 2 is a front elevational view of the door;

FIG. 3 shows a horizontal section of the oven door and the adjacent brickwork along the line **3—3** of FIG. 1;

FIG. 4 is an enlarged representation of the cam hook and roller portion of FIG. 1;

FIG. 5 represents a corresponding portion of FIG. 2;

FIG. 6 represents a vertical section of a second embodiment of the door;

FIG. 7 shows a front view of this embodiment;

FIG. 8 is a horizontal section along the line **8—8** of FIG. 6;

FIGS. 9 and 10 are enlarged detail views of the cam hook and roller, respectively, of FIGS. 6 and 7.

Referring now more particularly to the drawings, like numerals in the various figures will be employed to designate like parts.

In the embodiment of the invention illustrated in FIGS. 1–5, the oven brickwork **10** is seen to provide a vertical

door opening, as is the case in a horizontal coke oven, with vertically extending girders **11**, as best seen in FIG. 3 supporting the door frame **12**.

Door **13** has a U-shaped cross section. Clamping means **14** arranged about the periphery of the door secure a sealing edge **15** to the periphery of the door, with the sealing edge **15** intended to abut against a smooth seat **16** on the door frame, as best seen in FIG. 3. Door plug **17** protrudes into the oven chamber in conventional fashion.

In conventional fashion, the upper section of the door is provided with a leveling opening **18**, as best seen in FIGS. 1 and 2, and closure **19** is provided for this leveling opening. The aforedescribed structural components are conventional in horizontal coke oven doors, and are illustrated in both the FIGS. 1–5 embodiment of the invention and in the FIGS. 6–10 embodiments of the invention.

In order to obtain the necessary gas tight seal of the oven chamber, the door must be pressed against the door frame so as to abut the sealing elements **15** against the door frame seats **16**.

This is accomplished in accordance with the FIGS. 1–5 embodiment of the invention by providing a pair of hooks **20** fixed directly to the door frame **12** on opposite sides of the door at a point substantially mid-way up the height of the door opening. The hooks **20** are provided with camming surfaces **20***a* inclined downwardly so that the lower ends of the cam surfaces **20***a* are closest to the door opening, as best seen in FIG. 4.

A roller **21** having tapered cam following ends is adapted to ride over the cam surface **20***a*. Roller **21** is affixed to the door by means of lug **22** which is pivoted on bolt **23**. As will be understood by those skilled in the art, the pivotal movement of the roller **21** is limited by the length of lug **22**. The bolt **23** extends through openings **24** in load distributing struts **28** which are reinforced adjacent the bolt opening **24** by means of reinforcing plates **29**. Load distributing struts **28** extend substantially over the height of the door, as best seen in FIG. 2, and are spaced from the surface of the door **13**, being secured to the surface of the door by base plate **30** at the upper end of the strut, and base plate **31** at the lower end of the strut, as best seen in FIGS. 1 and 2.

In the embodiment of the invention illustrated in FIGS. 6–10, the door and door frame are substantially identical to that illustrated and described in connection with the FIGS. 1–5 embodiments, and like numerals are applied thereto. The means employed for urging the door **13** into sealing relationship with respect to the door frame **12** comprise hooks **20** like those described in connection with the FIGS. 1–5 embodiments having a cam surface **20***a* inclined downwardly so that the lower ends of the cam surface **20** are closest to the door opening.

The roller **21** described in connection with the FIGS. 1–5 embodiments is, however, replaced by rod **32** which is rigidly secured to the apex of a triangle comprising upper struts **3**, lower struts **34** and base strut **35**, which strut triangle is connected to the body of door **13** by means of base plates **30**, like base plates **30** of the FIGS. 1–5 embodiments. As illustrated, it is preferred that the angle between struts **33** and **34** be obtuse to implement load distribution. Rollers **38** are rotatably mounted on the free ends of rod **32**, as best seen in FIG. 10 to facilitate movement over the cam surfaces **20***a* of the hooks **20**.

OPERATION

In use, the door **13** is positioned in chamber closing position with respect to the coke oven by bringing the cam following roller **21**, or rollers **38**, against the cam surfaces **20***a* of hooks **20**.

In the FIGS. 1–5 embodiments, door sealing pressures are obtained by virtue of the fact that the weight of the door causes the free ends of roller **21** to ride downwardly

over came surface **20***a*. Lugs **22** pivot about bolt **23** to permit movement of roller **21**. As roller **21** descends to the bottom of the cam surface **20***a*, the door is brought against the door frame **12**, and desired sealing pressures are obtained. The stresses produced by the interaction of roller **21** and cam surface **20***a* are distributed over the door via struts **28** which transmit these forces to the upper and lower ends of the door. Struts **28** serve the additional function of rigidifying the door.

In the FIGS. 6–10 embodiments of the invention, the movement of rollers **38** over the cam surfaces **20***a* brings the door **13** against the door frame **12**. The pressures produced between rollers **38** and cam surfaces **20***a* are transmitted to the upper and lower ends of the door via struts **33** and **34** which transmit these forces to the base plates **30**. As in the FIGS. 1–6 embodiments the struts serve the additional function of rigidifying the door.

It is thus seen that by the utilization of only a single pair of hooks, desired sealing pressures may be obtained, with a relatively uniform distribution of these pressures over the area of the door. Positioning of the door merely requires care in orienting the single roller axis with respect to the hooks **20**, without requiring the extensive manipulation and care necessitated by the use of a plurality of pairs of hooks and rollers.

The above disclosure has been given by way of illustration and elucidation and not by way of limitation, and it is desired to protect all embodiments of the hereindisclosed inventive concept within the scope of the appended claim.

What is claimed is:

1. On a door adapted for positioning over an opening defined by a door frame, means for urging the door into closure position with respect to the opening, said means comprising: one and only one pair of spaced hook members fixed to said door frame and extending outwardly therefrom at opposed sides of said opening, said hook members having cam surfaces inclined so that the lower ends of the cam surfaces are closest to the door opening; cam following members carried by said door and being engageable with said cam surfaces when said door is positioned in said door opening; and load distributing means on said door for distributing the stresses imparted to the door when said cam following members are engaged with said cam surfaces, said load distributing means comprising a pair of struts extending substantially over the height of the door and being spaced from the surface of the door, said struts being secured to the surface of the door by a base plate at the upper end of the struts and a base plate at the lower end of the struts, said cam following members being attached to lug members which limit the pivotal movement of the cam following members, said lug members being attached to a bolt which is attached through an opening at the middle of said struts, said opening being reinforced by means of a reinforcing plate adjacent the opening.

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U.S. Cl. X.R.

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