June 3, 1969 H. WOLFF 3,448,014

SELF-SEALING DOOR FOR HORIZONTAL COKE OVENS UTILIZING FLUID PRESSURE EQUALIZING CYLINDER-PISTON MEANS

Filed June 22, 1967 Sheet 1 of 2

FIG-1

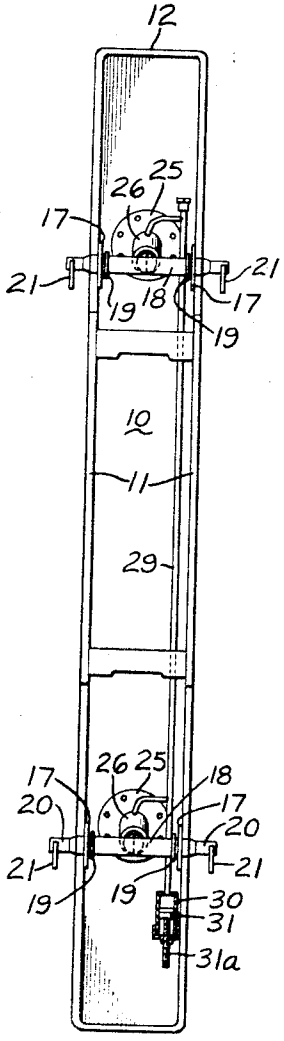
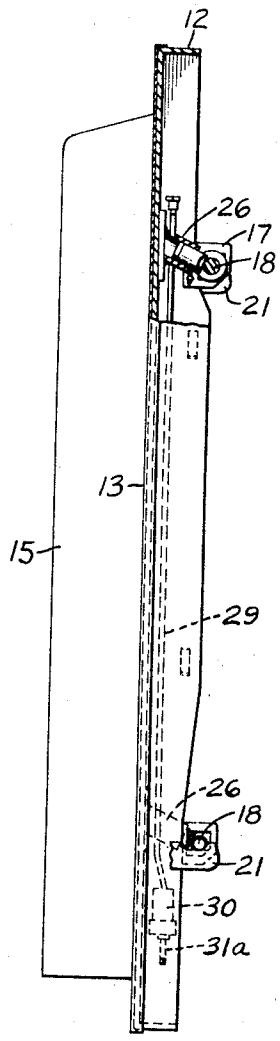


FIG-2



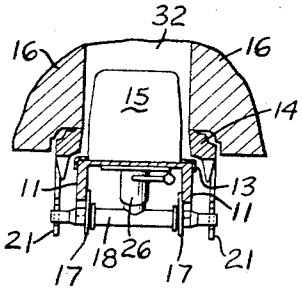


FIG-3

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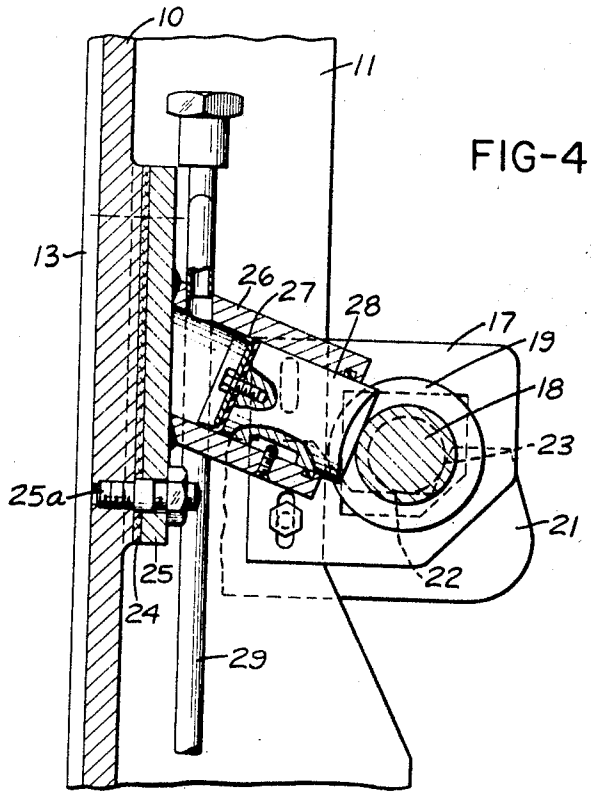


FIG-4

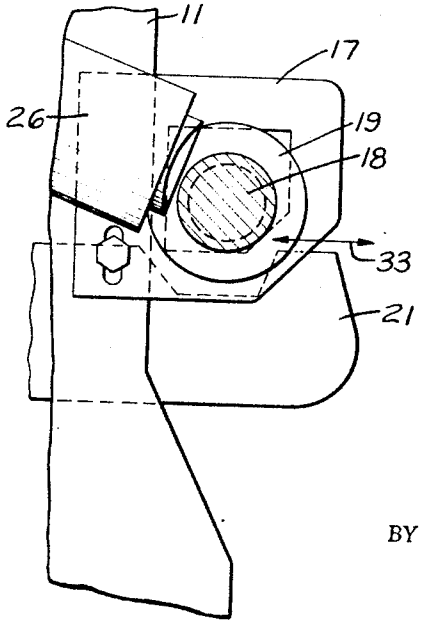


FIG-5

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3,448,014

Patented June 3, 1969

3,448,014

SELF-SEALING DOOR FOR HORIZONTAL COKE OVENS UTILIZING FLUID PRESSURE EQUALIZING CYLINDER-PISTON MEANS

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Filed June 22, 1967, Ser. No. 647,982

Int. Cl. C10b *25/06;* F23m *7/00*

U.S. Cl. 202—248

7 Claims

ABSTRACT OF THE DISCLOSURE

The present invention concerns a self-sealing door for horizontal coke ovens in which the contact pressure of the door against the frame of the oven is produced by the weight of the door itself in such a manner that horizontal locking beams arranged on the door at various heights abut against the inner side of the rear wall of hooks mounted on said frame. The self-sealing door according to the invention is characterized primarily in that pistons reciprocable in forwardly inclined hydraulic cylinders which are rigidly connected to the body of the door and which communicate with each other for hydraulic equalization, are operable to exert clamping action on the locking beams which loosely abut the body of the door when the latter is raised, and slide into recesses of said hooks as the door is lowered for clamping the door under the pressure exerted by said piston, against said frame.

This invention relates to a self-sealing door for horizontal coke ovens, in which the contact pressure of the door against the frame is produced by the weight of the door itself in such a manner that horizontal locking beams arranged on the door at various height levels will abut against the inner side of the rear wall of hooks mounted on the frame. In such doors, equalizing linkage bars have already been used to ensure that the sealing pressures produced by the door's own weight at the various levels are equalized so that an effective seal is attained at all points. In particular, the equalizing linkage bars used have taken the form of connecting bars, each being so connected to an intermediate lever that, when a locking beam abuts against the associated hooks, this causes the intermediate lever to pivot and thus the other locking beam to move with regard to the associated hooks.

It is an object of this invention to provide an improved self-sealing door of the above mentioned general type.

It is another object of this invention to provide a self-sealing door for horizontal coke ovens which will ensure a uniform contact pressure of the door over its entire height against the doorframe without using equalizing linkage bars.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIG. 1 is a front view of a door comprising the locking device according to the present invention.

FIG. 2 is partially a vertical section through the central plane of the door and partially a side view of the door.

FIG. 3 is a horizontal section of the door and the adjacent portions of the oven.

FIG. 4 is an enlarged representation of the upper sectioned part of FIG. 2 showing the position of the upper locking beam in locking position.

FIG. 5 shows the members of FIG. 4 during the insertion or removal of the door.

According to the invention, the effect of the door's own weight on the different locking beams is equalized by a

hydraulic system in such a manner that the pistons in hydraulic cylinders which latter are inclined forwardly, i.e., outwardly from the body of the door, and which are connected to the door and communicate with each other for hydraulic equalization, act on the locking beams which loosely abut against the body of the door when the door is raised and slide into recesses of hooks disposed on the doorframe as the door is lowered.

The closed hydraulic system comprising the hydraulic cylinders and the associated connecting pipes is provided with a member for pouring in the pressure fluid, e.g., oil, and with a device for adjusting the pistons.

The supports of the locking beams on the body of the door may be designed as closed brackets; laterally of the bracket supports, spacer rings are arranged on the beams to ensure that the beams remain centered.

If only one hydraulic cylinder is provided to act on each locking beam, this cylinder is so designed and centrally arranged that the front end of the piston comes into point-shaped abutment. In this case a uniform contact pressure on the left-hand and right-hand sides of the door is attained even if the spaces between the rear walls of the frame hooks and the doorframe vary.

Referring now to the drawings in detail, the basic body of the door has a horizontal U-shaped cross-section comprising a plate **10** to which are joined two lateral walls **11** and upper and lower transverse members **12**. The sealing portions **13** on the circumference of the door is held in place by means of known clamping means so that it abuts against the smooth front surface of a doorframe **14** to form a seal, said doorframe **14** defining the oven opening. A refractory door plug **15** fixed to the body of the door protrudes into the oven chambers **32**, which are surrounded by furnace brickwork **16**.

The top and the bottom of both lateral walls **11** of the door are provided with brackets **17** having an opening therethrough. A locking beam **18** rests on the lower side of said bracket **17** when the door is removed (see FIG. 5). Beam **18** supports spacer rings **19** which abut the inner sides of brackets **17** and ensure that the beam remains centered. The locking beam **18** is tapered towards its roller-like end pieces **20**. When the door is lowered, the end pieces or ends **20** rest against the bottom surfaces **22** and rear walls **23** of hooks **21** arranged on both sides of doorframe **14** at the levels of the locking beams.

At the levels of the locking beams one hydraulic cylinder **26** each is arranged on the body of the door; it is firmly mounted on plate **25** which, with an interposed asbestos layer **24**, is screwed to the door by screws **25***a*. Each cylinder **26** is slightly forwardly inclined and has reciprocably mounted therein a piston **28**, sealed by a packing disk **27**. Upper cylinder **26** and lower cylinder **26** communicate with each other by means of a pipe **29**.

At the lower end of pipe **29** there is located a device for adjusting the pistons. This device comprises a cylinder **30** (FIG. 1) and a piston **31**, which includes a packing and the position of which can be adjusted by screw means **31***a*. The entire hydraulic system, comprising cylinders **26**, connecting pipe **29** and cylinder **30** of the adjusting device, is filled with liquid through an opening disposed at the uppermost point of pipe **29** and is subsequently sealed by a screw. Before filling the system, piston **31** is brought into a central position so that later on piston **31** can be adjusted in inward or outward direction within cylinder **30** by the said screw means **31***a*.

Cylinders **26** are so arranged with regard to the body of the door **11** that, as the door is lowered into position, pistons **28** achieve central and point-like abutment on locking beams **18**; this point-like abutment is attained by rounding or sloping the ends of pistons **28** towards the center so that, as the door is lowered, only one point

of the supporting line comes to abut against the locking beam tangentially. When the door is lowered and one of the two pistons **28**, either the upper or the lower one, abuts before the other, this piston is pushed into the cylinder. Consequently, the other piston **28** is urged outwardly until it also comes into abutment with and is pressed against the corresponding other locking beam **18**. In this manner the weight of the door is via the two hydraulic cylinders **26** and pistons **28** uniformly distributed over the locking beams **18** and thus over the hooks **21**, so that a uniform positive connection between the door supporting sealing portion **13** and doorframe **14** will be actieved.

When the door is inserted, it is raised to such an extent that the tapered ends **20** of the locking beams resting in brackets **17** pass over the upper edges of door hooks **21**. Reference numeral **33** in FIG. 5 designates a double arrow indicating the inward and outward movement of the lower edges of roller ends **20**. When the door has come to abut and is then lowered, the locking beams **18** are at first still supported on the lower sides of brackets **17** until they abut against bottom surfaces **22** and rear walls **23** of frame hooks **21**. With the lowering of the door also cylinders **26** move downwardly. First one of the pistons **28** will abut against one of the locking beams **18**, and directly thereafter the other piston **28** will abut against the other locking beam **18** as a result of pressure equalization. The weight of the door is thus borne by hooks **21**, and the door lifting mechanism can be withdrawn.

When lifting the door away, hydraulic cylinders **26** are first relieved, which sets the locking beams free. After another further upward movement, locking beams **18** are received by the lower sides of brackets **17**. In the position shown in FIG. 5, the door may then be drawn backwards, thus clearing the opening of oven chamber **32**.

The adjusting device comprising cylinder **30** and piston **31** operates as follows:

Should it be found when inserting the door, that pistons **28** abut against locking beams **18** above their center, piston **31** will, after the door has been lifted, be screwed forwardly until the liquid displaced from cylinder **30** urges pistons **28** outwardly so that said pistons **28** abut centrally against beams **18**. Conversely, if pistons **28** abut beams **18** below the center thereof, piston **31** is turned back accordingly.

The afore-described adjustment is effected only when the door is inserted for the first time and may possibly be readjusted after a longer period of operation.

In the door shown, rear wall **23** of hook **21** is inclined upwardly. This ensures that locking beams **18** will engage securely. However, it is also possible to use a hook which is shaped so that its rear wall **23** forms an angle of 90° with its bottom surface **22**. The angle formed between the axis of cylinder **26** and the horizontal is highly advantageous in attaining the desired contact pressure for sealing the door by means of its own weight. In the particular embodiment shown, this angle is about 20°. A preferred range for the said angle is between 19 and 22°.

The door shown in the drawing comprises only an upper and a lower locking place with one associated hydraulic cylinder each. If the doors are higher, however, the arrangement of three or more locking places of the same type may be expedient. In this case the piston of a hydraulic cylinder associated with the locking place acts on each individual locking beam.

It is, of course, to be understood that the present invention is, by no means, limited to the particular embodiment of the invention that has been described above,

but also comprises any modifications within the scope of the appended claims.

What I claim is:

1. In combination with a horizontal coke oven having frame means with horizontal and vertical frame sections defining an oven opening and also having a door for selectively closing and opening said oven opening, a plurality of vertically spaced locking beams, a plurality of vertically spaced sets of horizontally spaced supporting means connected to said door for supporting said locking beams, a plurality of vertically spaced sets of horizontally spaced hook means connected to and protruding outwardly from said vertical frame sections and arranged laterally of said door and respectively in at least approximate alignment with said locking beams when said door is in its position in which it closes said oven opening, said locking beams having extensions laterally protruding beyond said door for engagement with said hook means in said closing position of said door, and a plurality of vertically spaced intercommunicating fluid operable cylinder-piston means supported by said door and extending outwardly of said door for respectively clamping said locking beam extensions under equalized fluid pressure conditions against said hook means in said closing position of said door.

2. A door according to claim **1**, in which said cylinder-piston means, all under equalized fluid pressure, have their axes inclined with regard to the respective adjacent locking beam.

3. A door according to claim **1**, in which said cylinder-piston means irrespective of temperature are so located and operable as to engage the central portion of the respective adjacent locking beam under equalized pressure.

4. A door according to claim **3**, in which each of said cylinder-piston means comprises a cylinder rigidly connected to said door and a piston reciprocable in said cylinder and having its outer end face tapered so as to form a reduced surface for contact tangentially at only one point with the respective adjacent locking beam.

5. A door according to claim **1**, in which said supporting means for said locking beams are formed by brackets with openings therethrough greater than the diameter of said locking beams extending therethrough, and in which spacer means are arranged on said beams between said brackets for maintaining said beams centered with regard to the sides of said door further to assure pressure equalization.

6. A door according to claim **1**, which includes conduit means adapted to be filled with fluid and establishing intercommunication of said cylinder-piston means, and adjusting means connected to said conduit means and operable selectively to increase and decrease the available volume of said conduit means for pressure equalization irrespective of temperature.

7. A door according to claim **1**, in which locking beam roller ends engage said supporting means adjustably connected to said door.

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U.S. Cl. X.R.

110—173; 212—4