March 2, 1971 K. REINFELD ET AL 3,567,590

LEVELER DOOR AND OPERATING MECHANISM

Filed Jan. 21, 1969 2 Sheets-Sheet 1

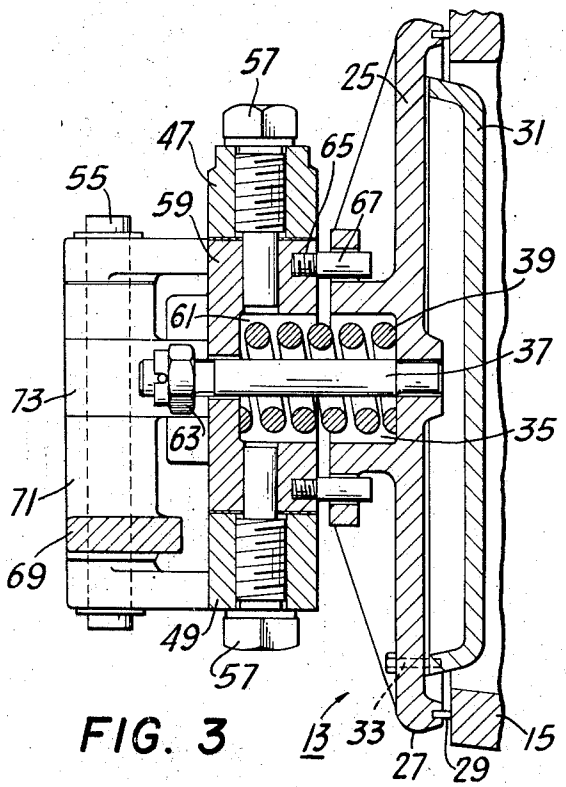

FIG. 3

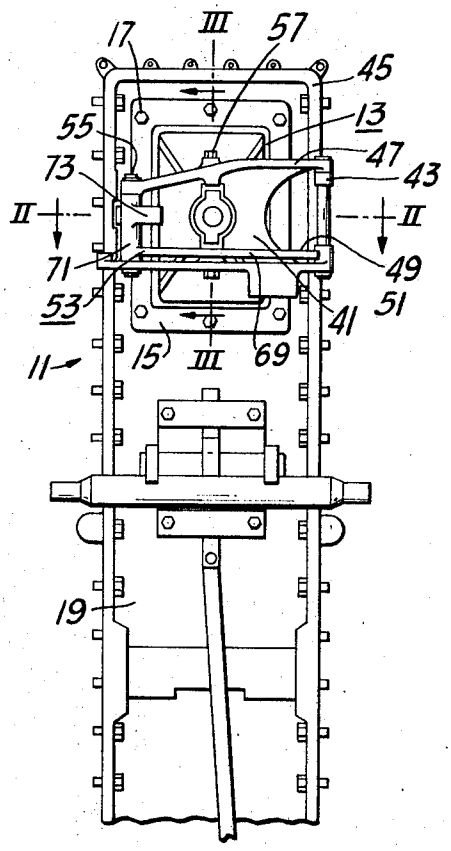

FIG. 1

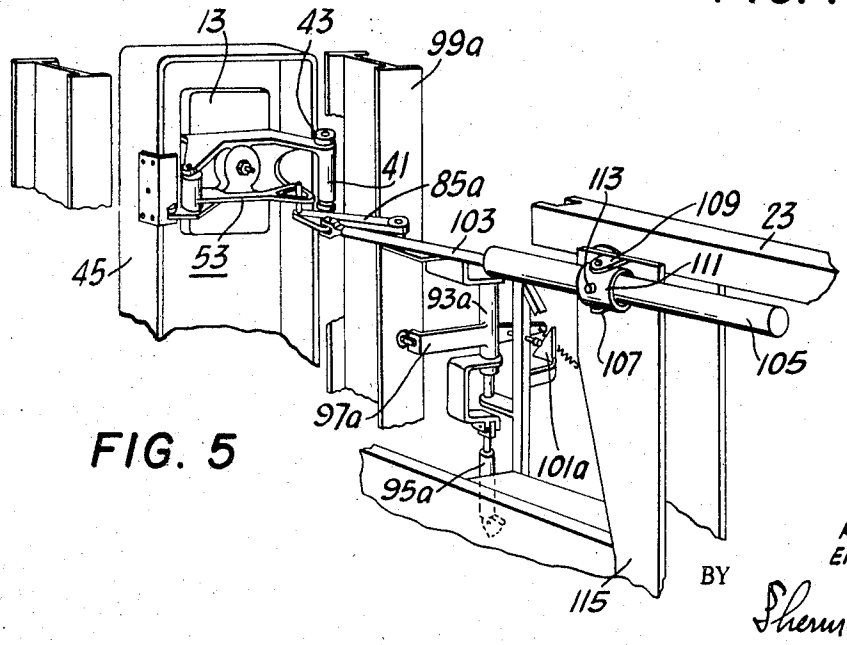

FIG. 5

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LEVELER DOOR AND OPERATING MECHANISM

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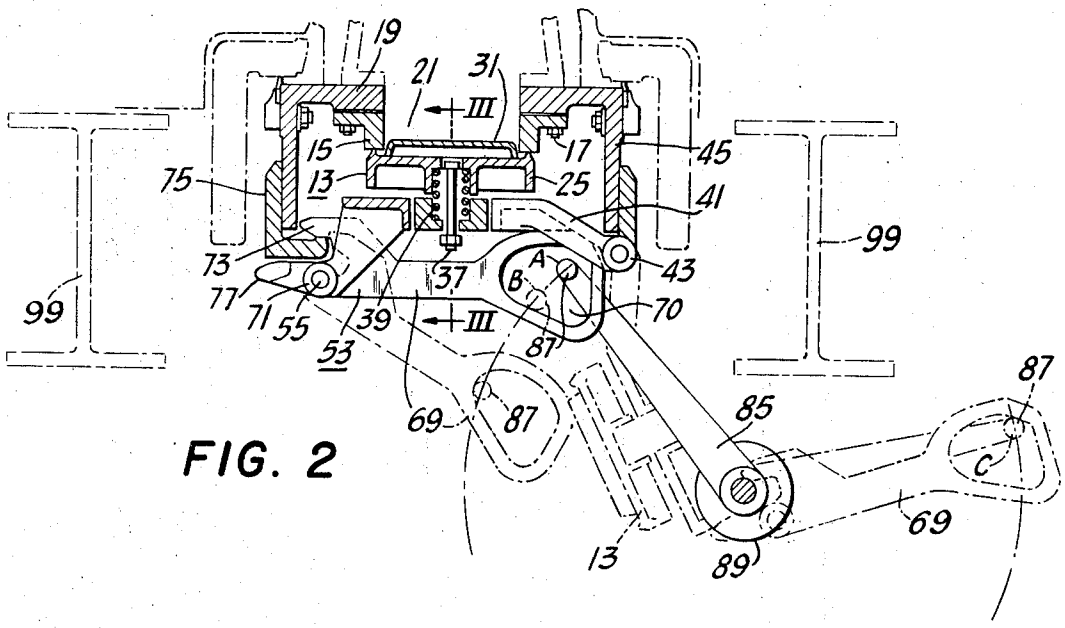

FIG. 2

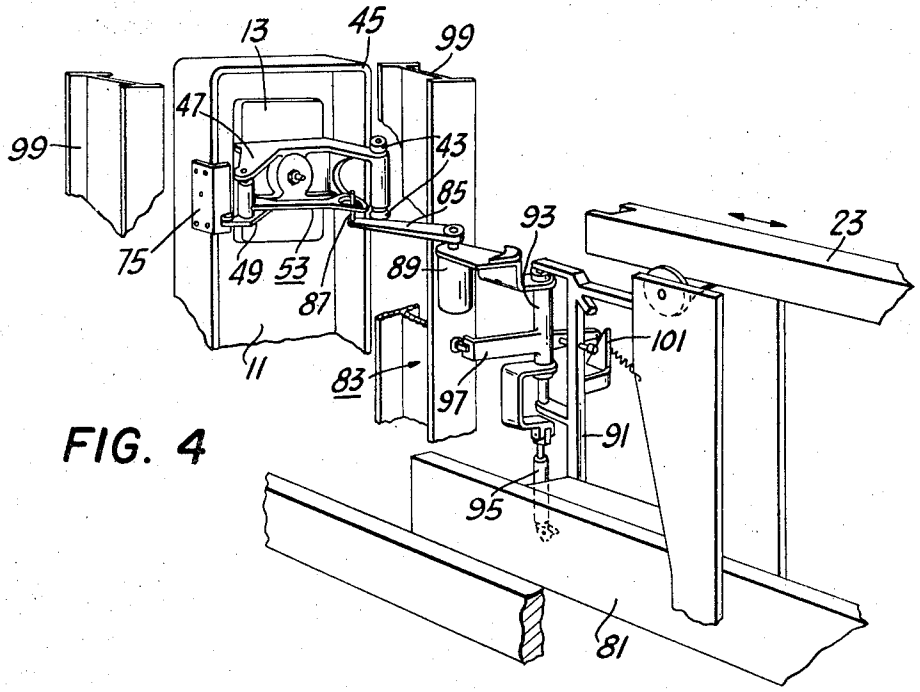

FIG. 4

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LEVELER DOOR AND OPERATING MECHANISM

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Int. Cl. C10b 25/12
U.S. Cl. 202—248 6 Claims

ABSTRACT OF THE DISCLOSURE

A leveler bar door is resiliently mounted to a frame which pivots about a vertical axis, and a latch is mounted to the door in biased relation to the door frame. A remotely controlled latch operating mechanism can be actuated to engage the latch to open and close the door when the leveler bar is aligned with the door opening.

BACKGROUND OF THE INVENTION

In conventional coke oven doors located on the pusher side of a coke oven chamber, there its a small leveler bar door located near the top of the coking chamber. Such door is usually opened after fresh coal has been charged into a coking chamber, and a coal leveler bar is extended from the pusher machine into the coking chamber to level the top of the coal in the coking chamber.

In one instance, heretofore, the leveler bar door is equipped with hinges, and a hand wheel mounted on a screw is turned to secure the door in place. When the hand wheel is turned to loosen the door, a bracket becomes unlatched, and the leveler bar door is swung open by hand. After leveling the coal, the bar is withdrawn and the leveler bar door is swung shut; the latch set in place; and the hand wheel is turned to tighten the leveler door.

Such a leveler bar door operated by hand and its operation is slow and often times the door is not tightly closed. Further, because the door is operated manually, there is always the constant danger of injury to personnel who are required to open and close such doors.

The present invention is an improved leveler bar door that is operable from a remote location with a mechanical tool, or with an electro-mechanical device that makes opening and closing the door a simple and efficient operation.

SUMMARY OF THE INVENTION

Apparatus of the invention includes a resiliently biased leveler bar door mounted to a bracket that is pivotable about a vertical axis in a side hinge. A latch maintains the door in the closed position, and a latch engaging mechanism, mounted to the pusher machine, is adapted to engage the latch to open and close the leveler bar door. The latch engaging mechanism retracts from the latch engaging position when the pusher machine moves from one coke oven chamber to another.

For a further understanding of the present invention and for advantages and features thereof, reference may be made to the following description taken in conjunction with accompanying drawings which show for the purpose of exemplification an embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWING

The invention is illustrated in the drawing wherein:

FIG. 1 is a schematic front elevational view of the upper portion of the coke oven door, including a leveler bar door in accordance with the invention;

FIG. 2 is a view along line II—II of FIG. 1;

FIG. 3 is a view along line III—III of FIGS. 1 and 2;

FIG. 4 is a schematic perspective view of the door of FIG. 1 showing one embodiment of apparatus in accordance with the invention to open and close the door; and

FIG. 5 is a schematic perspective view of the door of FIG. 1 showing another embodiment of apparatus in accordance with the invention to open and close the door.

DETAILED DESCRIPTION

FIG. 1 illustrates the upper portion of a coke oven door **11** including a hinged leveler bar door **13** in accordance with the invention. The leveler bar door **13** cooperates with a door frame **15** that is secured, as by bolts **17**, to a central panel **19** of the coke oven door **11**, and that has an opening **21** therethrough to admit a leveler bar **23** (FIGS. 4 and 5) into and out of the coking chamber to level the coal charged therein.

The leveler bar door **13** includes a main door body portion **25** having a peripheral edge **27** that carries a knife-edge sealing bar or strip **29**. A dished heat shield **31** is secured to the door body portion **25** by means of a plurality of fasteners, such as cap screws **33**. The main body portion **25** also includes a recess **35** in its outer surface, and a pin **37**, threaded into the main body portion **25**, extends outwardly therefrom as shown in FIG. 3.

The main door body portion **25**, and the members associated with it, are resiliently mounted, as by a coil spring **39**, to a pivotable support bracket **41** that is pivotally mounted to a hinge **43** fixed to the coke oven door frame **45**.

The pivotable support bracket **41** includes upper **47** and lower **49** transverse support bars that are mounted at one end by a hinge pin **51** to the hinge **43**, and that are mounted at their opposite ends to a pivotable latch **53** (FIG. 2) by a pivot pin **55**.

Intermediate the length of the upper **47** and lower **49** transverse support bars, there is a mounting on each said bar that accommodates a pivot pin **57** which is threadedly connected to a door support **59**. The door support **59** surrounds the pin **37** and is provided with a socket **61** that receives the other end of the spring **39**. A nut **63** is threaded onto the pin **37** to retain the door support **59** in position. The door support **59** is provided with a pair of diametrically opposed threaded holes **65** within which guide pins **67** are threaded; such guide pins **67** also being slidably cooperative with the main leveling door body **25**, as shown in FIG. 3. Thus, the resilient member or spring **39** maintains the door support **59** and the main door portion **25** in opposition since one is movable relative to the other, and the movement is guided by the pins **67**.

The latch **53** includes a handle portion **69** that is provided with an open loop **70** at one end, while the other end is fixed to a tubular member **71** (FIG. 1) to which is fixed a cam latch **73**. The pivot pin **55** cooperates with the tubular member **71** so that the latch **53** can pivot relative to the support bracket **41**. The cam latch **73** is so shaped as at **77**, that it is engageable with an abutment or stop **75** fixedly mouned to the coke oven door frame **15** to hold the leveler bar door **13** in the closed position.

Movement of the handle portion **69** in a clockwise direction, as viewed in FIG. 2, disengages the cam portion **73** from the abutment **75** so that the leveler bar door **13** may be pivoted about the hinge **43** to open the leveler bar opening **21** in the coke oven door panel **19**. The leveler bar door **13** may be swung open to some such position as that shown by the dotted outline in FIG. 2.

When the coal has been leveled and the leveler bar **23** has been retracted, the door **13** may be swung clockwise to its closed position. Thereafter, the cam latch **73** engages the fixed abutment or stop **75**, and further counterclockwise movement of the handle portion **69** urges the support bracket **41** toward the coke oven door **11**. The resilient or spring means **39** in turn urges the leveler bar door body portion **25** and its sealing bar or strip **29** into seating contact with the leveler bar door frame **15**.

While in some instances the operation of the latch mechanism **53** may be successfully performed manually, it is more advantageous in most instances to open and close the leveler bar door **13** as part of the sequence for charging a coke oven chamber with fresh coal. Then, such operation of the leveler bar door **13** is most effectively accomplished by an electro-mechanical or hydro-mechanical means that is coordinated with the pushing and charging machinery.

Preferably, apparatus for operating the latch mechanism **53** is an electro-mechanical apparatus, such as that shown in FIG. 4 or FIG. 5. Of course, hydro-mechanical or air operated apparatus may be used if preferred.

The leveler bar **23**, shown in its retracted position, is supported on rollers **79** mounted to a pusher machine **81**. Also mounted to the pusher machine **81** is an electro-mechanical latch operating mechanism **83**. Likewise, either hydro-mechanical or air operated apparatus may be used to operate the latch operating mechanism.

The latch operating mechanism **83** (FIG. 4) includes a pivotable latch actuating arm **85** and a latch engaging pin **87**; a rotary actuator **89** to which the latch actuating arm **85** is mounted; a support frame **91** mounted to the pusher machine **81**; a pivotable support bracket **93** mounted to the support frame **91**; a fluid-actuated, cylinder-piston assembly **95** mounted to the pusher machine **81** and to the support bracket **93**; and, an indexing arm **97** mounted to the pivotable support bracket.

The latch operating mechanism **83** is remotely controlled so that, when the pusher machine **81** is aligned with a coking chamber that is to be pushed, the indexing arm **97** is not in contact with a buckstay **99** adjacent the coking chamber to be pushed. The pusher machine operator may then actuate the fluid-actuated cylinder-piston **95** to raise the support bracket **93** and the latch operating mechanism **83** associated with it. As the latch operating mechanism **83** raises, the indexing arm **97** engages the buckstay **99**, and the latch engaging pin **87** projects through the loop **70** in the handle **69**, as suggested in FIG. 4. The latch operating mechanism **83** is now in position to open and close the leveler bar door **13**.

The rotary actuator **89** is air, hydraulic, or electric operated and is capable of turning the latch actuating arm **85** and the pin **87** along an arc subtending an angle of about 280°; that is from the position shown in solid lines in FIG. 2 to the position shown by the dot dash outline in the same figure.

The latch engaging pin **87** is at position A initially, and it moves to position B where it engages the handle **69**. The handle **69** then pivots about pin **55** and the cam latch **73** disengages from the abutment or stop **75**. Immediately the cam latch **73** disengages from the stop **75**, the spring urges the support bracket **41** and latch **53** away from the coke oven door **11** and the sealing bar or strip **29** is no longer under spring pressure or resilient bias against the leveler bar door frame **15**.

Further rotational movement of the actuating arm **85** and pin **87** in a counterclockwise direction pivots the leveler bar door **13** to the position shown by the dash dot outline in FIG. 2; the pin **87** moving to position C.

After the coal in the coking chamber has been leveled, and after the leveler bar has been retracted, the rotary actuator **89** reverses direction and pivots the latch **53** and the leveler bar door **13** in a counterclockwise direction. The leveler bar door **13** covers the opening **21** in the coke oven door **11**, and further clockwise rotation of the latch engaging arm **85** urges the cam latch **73** into engagement with the stop **75**. The leveler bar door sealing bar **29** also moves into sealing engagement with the leveler bar door frame **15** under the influence of the spring **39**.

Thereupon, the cylinder-piston assembly **95** is actuated to lower the support bracket **93**, and to move the latch actuating arm and pin below the level of the latch handle **69**.

When the latch actuating arm **85** lowers, the indexing arm **97** coacts with a fixed cam **101** suitably mounted to adjacent immovable structure whereby the indexing arm **97** is pivoted about the vertical axis of the support bracket **93** to a position that allows the pusher machine to move alongside the face of the coke oven battery without damaging the indexing arm **97**.

FIG. 5 illustrates a modification of the latch actuating mechanism **83** shown in FIG. 4. In FIG. 5, a latch actuating arm **85***a* is merely pivotally mounted to a support bracket **93***a* which is movable vertically by means of a cylinder-piston or electric cylinder assembly **95***a*. The latch actuating arm **85***a* is pin connected to a piston rod **103** of a cylinder assembly **105** universally pivotally mounted to a bracket **107** mounted to a frame **115** forming a part of the pusher machine **81**.

The bracket **107** (FIG. 5) includes top and bottom outwardly projecting arms **109** between which is positioned a vertically pivoting universal ring **111**. The ring **111** is provided with trunnions **113** to support the cylinder-piston assembly **105** at its horizontally pivoting trunnions. Assembly **105** is on the same horizontal plane as actuating arm **85**, when operating and slightly tilted when the actuating arm is moved down.

Like the support bracket **93** of FIG. 4, the support bracket **93***a* of FIG. 5 includes an indexing arm **97***a* that engages a buckstay **99***a* and a cam **101***a* in the way described previously.

After a coking chamber has been charged with fresh coal, it is necessary to level the coal by reciprocating a bar in the coking chamber; a leveler bar passing through a small door in the top portion of a coke chamber door.

When the pusher machine is so positioned that the leveler bar is aligned with the leveler bar door, the indexing arm contacts one of the buckstay adjacent the coking chamber to insure that the latch operating mechanism is in proper aligned position. Then, the latch operating mechanism may be raised, and the latch engaging pin cooperates with the latch to open and close the leveler bar door.

Those skilled in the art will recognize numerous features and advantages of the present invention among which are:

That the leveler bar door can be opened and closed by a powered mechanism from a remote location such as in the operator's cab of the pusher machine;

That the use of a spring-loaded arrangement providing live pressure between the door and the door jamb permits easy latching of the leveler bar door and positive contact of the door seal on its jamb;

That the leveler bar door can be opened and closed safely and more quickly from a remote location without danger to personnel who, heretofore, have had to open and close leveler bar doors in the prior art manually;

That the pivoting intermediate door support permits the leveler bar door to pivot on a vertical axis and to close without applying excessive side pressure on the door sealing strip; and

That the spring-loaded leveler bar door applies equal pressure to the sealing strip to insure a satisfactory seal with the door jamb.

What is claimed is:

1. In a coke oven battery having a closure for a coking chamber and an opening in said closure to admit a leveling bar for leveling coal in said chamber, the combination with said closure comprising:

(a) a frame surrounding said opening and secured to said closure;

(b) a door pivotally mounted to said frame and movable relative thereto for covering said opening;

(c) latch means pivotally mounted to said door for engaging said frame and for maintaining said door in a closed position covering said opening; and

(d) remotely controlled means engageable with said latch means for unlatching and for latching and

opening and closing said door, said remotely controlled means including:

(i) an arm mounted to an actuator and engageable with said latch means,

(ii) a fluid-actuated cylinder-piston connected to said arm for moving said arm, and

(iii) means for indexing said arm relative to said latch whereby said arm is engageable with said latch means when said cylinder-piston moves said arm into operative juxtaposition therewith.

2. The invention of claim **1** wherein:

(a) said means to index said arm includes a lever pivotally mounted adjacent said fluid-actuated cylinder-piston and engageable with said coke oven battery.

3. The invention of claim **2** including:

(a) means to pivot said indexing lever to an inoperative position when said latch operating mechanism disengages from said latch means.

4. In a coke oven battery having a closure for a coking chamber and an opening in said closure to admit a leveling bar for leveling coal charged in the chamber, the combination with said closure comprising:

(a) a frame surrounding said opening and secured to said closure;

(b) a support bracket pivotally mounted to said frame;

(c) a door mounted to said support bracket and movable relative to said door frame, said door being adapted to cover said opening in said closure;

(d) a heat shield secured to said door that is directed toward said coking chamber;

(e) a spring resiliently biasing said door body portion to said support bracket;

(f) guide means maintaining said door and said support bracket in a preselected relation;

(g) sealing means carried by said door for forming a seal with said door frame when said door is closed;

(h) a latch pivotally mounted to said support bracket and having a latch cam and a latch actuating arm;

(i) means on said door frame that is engageable with said cam latch portion to maintain said door in the closed position; and

(j) means for actuating said latch and for opening and for closing said door including:

(i) an arm mounted to an actuator and engageable with said latch,

(ii) a fluid-actuated cylinder-piston connected to said arm.

(iii) means to actuate said cylinder-piston to bring said arm into operative juxtaposition relative to said latch means,

(iv) means for indexing said arm relative to said latch whereby said arm is engageable with said latch when said cylinder-piston moves said arm into said operative juxtaposition, and

(v) means to activate said actuator to pivot said arm thereby disengaging said latch means from said frame.

5. The invention of claim **4** wherein:

(a) said means to index said arm includes a lever pivotally mounted adjacent said cylinder-piston engageable with said coke oven battery.

6. The invention of claim **5** including:

(a) means to pivot said lever to an inoperative position when said latch engaging mechanism disengages from said latch.

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