

June 6, 1961

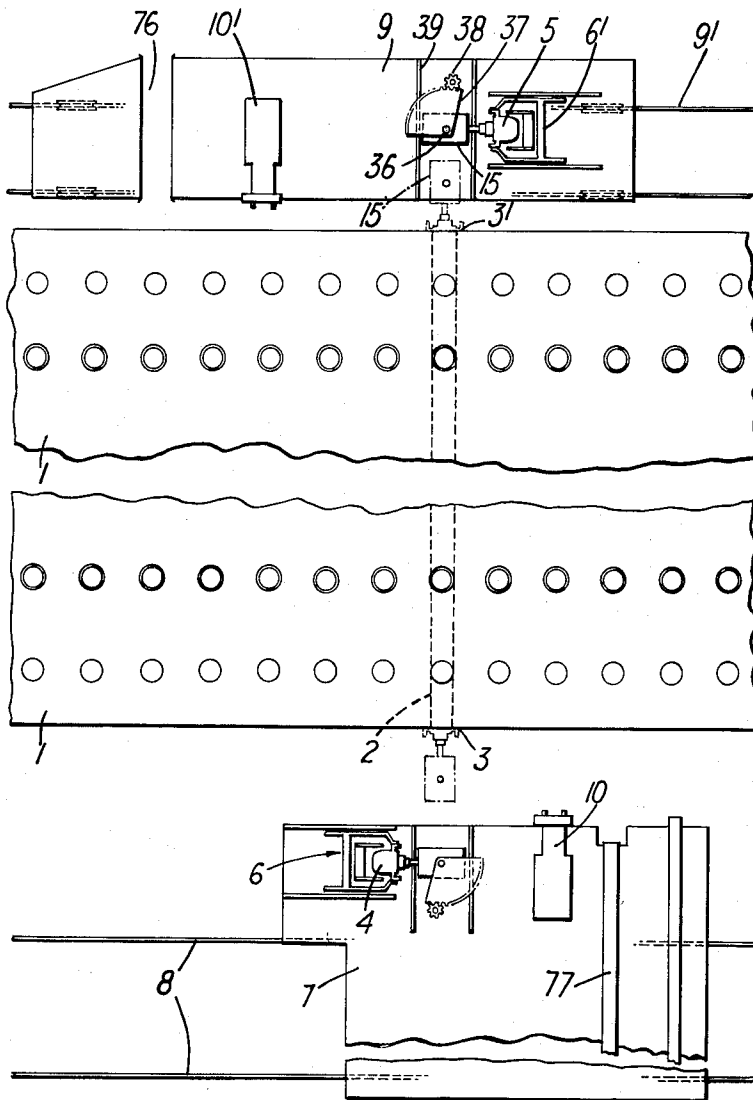
G. E. C. RANDELL ET AL
CLEANING OF SEALING SURFACES FOR DOORS ON THE
DOOR FRAMES OF HORIZONTAL COKE OVENS

2,986,758

Filed Dec. 16, 1958

3 Sheets-Sheet 1

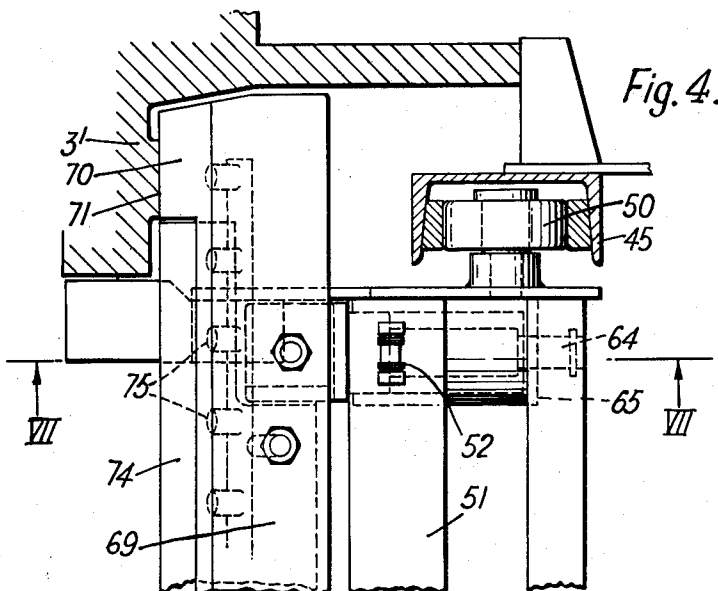
Fig. 1.



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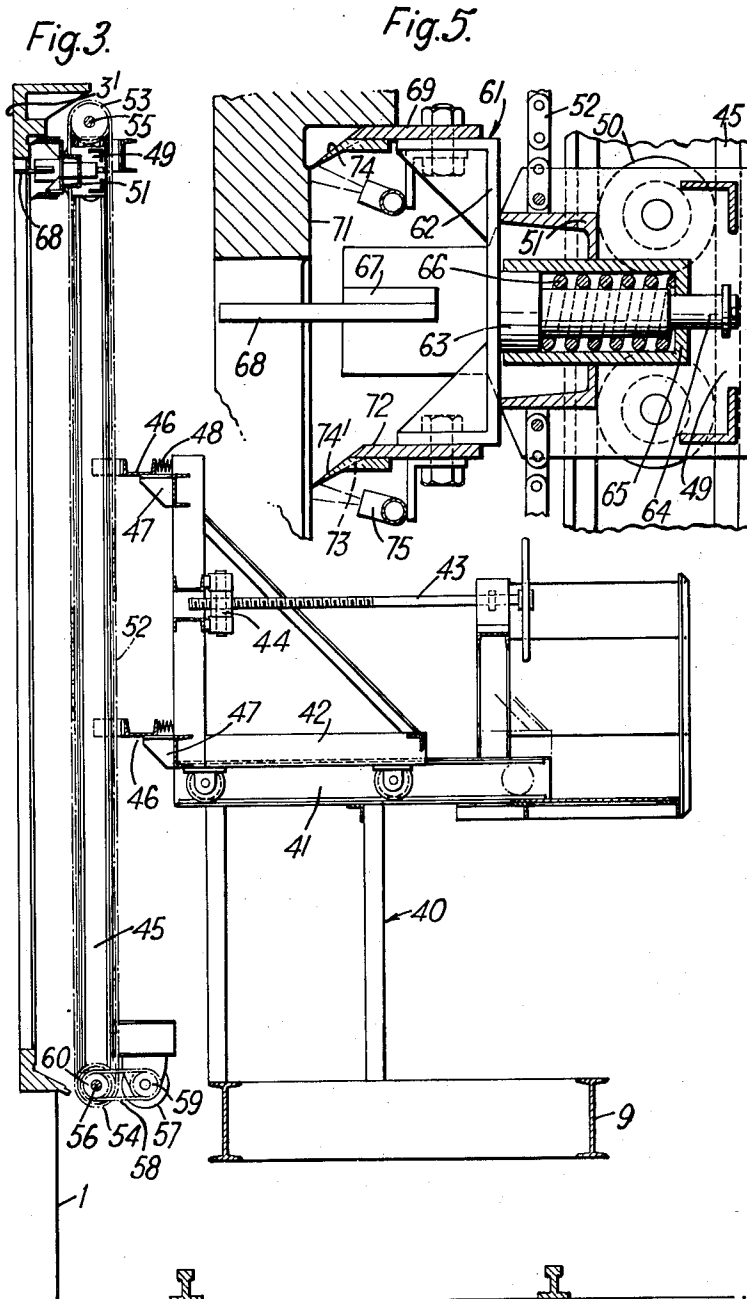
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CLEANING OF SEALING SURFACES FOR DOORS ON THE DOOR FRAMES OF HORIZONTAL COKE OVENS

Geoffrey Edward Charles Randell, Herbert Milton Whitworth, and Jack Holme, London, England, assignors to Woodall-Duckham Construction Company Limited, London, England, a British company

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2 Claims. (Cl. 15—93)

This invention concerns a new or improved apparatus for cleaning the sealing surfaces for the doors on the door frames of horizontal coke ovens, and is especially, but not exclusively, concerned with cleaning the sealing surfaces of self-sealing coke oven door frames at the ends of the ovens into which such doors are to be fitted.

Self-sealing doors for coke ovens have a sealing strip extending therearound and presenting a knife edge to the door frame for sealing engagement therewith. Desirably the sealing strip is resiliently mounted on the door and frequently is furnished along one edge of, or forms part of, a carrier member of angular, approximately U-shaped, or Z-shaped cross-section secured to the door, such sealing strip and carrier member comprising parallel vertical or side portions and horizontal top and bottom portions connected by corner portions to the said vertical or side portions.

It is well known that the effectiveness of the seal made between a self-sealing coke oven door and its frame depends upon the sealing surfaces being initially clean and that, because of the formation of deposits (which are larger of a pitchy nature) on the sealing surfaces, it is necessary periodically to clean these surfaces.

At the present time it is customary to remove a coke oven door from its frame at the end of an oven and to clean manually the surfaces of the door frame, these surfaces, of course, having to be cleaned in situ where the heat conditions are extremely trying for the operators with the result that efficient cleaning of the sealing surface of the door frame is rarely achieved.

The sealing surfaces of the door frames are extremely difficult efficiently to clean by manual means since the pitchy substances that have been deposited on the sealing surfaces quickly solidify when the door is taken away from the oven.

An object of this invention is to provide improved means for mechanically effecting the cleaning of the sealing surfaces of coke oven door frames.

According to this invention there is provided a horizontal coke oven door frame sealing surface-cleaning apparatus comprising a main carriage traversable alongside a coke oven battery with mechanical door-sealing surface cleaning means mounted on said carriage, and mechanical door handling means also mounted on said carriage and adapted for engagement with a coke oven door to withdraw it from, or to replace it in, its frame in the end of an oven, such door handling means and said mechanical door sealing surface-cleaning means being so constructed and arranged that a door removed from an oven by said handling means may be brought into sealing-surface cleaning relationship with said mechanical cleaning means for cleaning thereby.

Conveniently the said door handling means may comprise a door extracting and replacing head which can be advanced towards or withdrawn from an oven in the direction of the axis of the latter, and which may also be swung about a vertical axis to swing a door carried thereby into or from a plane transverse, for example at right angles to, the plane of the door frame from which the door has been extracted or into which the door is to be replaced.

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The said door extracting and replacing head may be mounted on an auxiliary carriage located on said main carriage for movement transversely of the direction of travel of the main carriage so that the door extracting and replacing head may be moved towards or away from the battery side. The said auxiliary carriage for the said door extracting and replacing head may be mounted on transverse rails on the main carriage or be suspended from overhead on suitable links or be otherwise so mounted with respect to the main carriage as to permit the said head to be advanced towards, or withdrawn from, the side of the battery.

The said main carriage may conveniently be combined with, or formed by, a coke guide machine or a pusher machine although it could alternatively be a separate carriage.

According to the invention the main carriage is also provided with mechanical means for cleaning the sealing surfaces of a door frame after the removal of a door therefrom, such door frame cleaning means being mounted on said carriage and being adapted to be moved on, or relatively to, the latter transversely of the normal direction of travel of the carriage so as to introduce the said mechanical cleaning means into a door frame ready for cleaning the sealing surface of the latter and so as to enable the said mechanical cleaning means subsequently to be withdrawn from said door frame.

The said door frame cleaning means may be mounted on said main carriage in any suitable manner permitting them to be advanced towards or withdrawn from the battery, but conveniently the said means are mounted on rails arranged transversely of the said main carriage and are traversable along such rails towards and away from the adjacent battery side.

The apparatus for mechanically cleaning the sealing surfaces of the coke oven doors and the sealing surfaces of the door frames may be constructed and arranged as described in the specification of our co-pending patent application Serial No. 780,782, filed December 16, 1958, entitled Cleaning of Sealing Surfaces of Doors and Door Frames of Horizontal Coke Ovens, executed of even date.

We have found that the pitchy deposits upon the sealing surfaces to be cleaned, can be much more efficiently cleaned-off if the deposits and/or the scraper means used for removing such deposits are heated by the application thereto of extraneous or supplementary heat, i.e. heat additional to that which they already possess, and consequently it is preferred in cleaning the said sealing surfaces to make use of the method and means of cleaning the surfaces described in the specification of our said co-pending patent application. Heating the scraper means themselves ensures that these will shed the deposits scraped from the sealing surfaces thereby.

In order that the nature of this invention may be more readily understood and the invention carried into practice, certain embodiments of the same will now be described by way of example with reference to the accompanying drawings in which:

FIGURE 1 is a fragmentary diagrammatic plan of a horizontal coke oven battery and of the pusher and coke guide machines for that battery, such machines having the present invention applied thereto;

FIGURE 2 is a sectional plan view of the apparatus for mechanically cleaning the sealing surfaces of a door frame of the coke oven battery, the figure showing the apparatus in operation for cleaning such frame;

FIGURE 3 is a section on line V—V, FIGURE 2;

FIGURE 4 is an enlarged fragmentary horizontal sectional plan of the scrapers of the apparatus shown in FIGURES 2 and 3;

FIGURE 5 is a vertical section on line VII—VII, FIGURE 4; and

FIGURE 6 is a fragmentary rear elevation showing the drive for the scraper carriage of the apparatus shown in FIGURES 2 to 5.

In FIGURE 1 of the drawings, 1 represents a horizontal coke oven battery of which one oven 2 is indicated in dotted lines, door frames 3 and 3' being provided at opposite ends of the oven to receive a door, these doors being indicated in this figure by the references 4 and 5 and being shown removed from the door frames 3 and 3' and in position in mechanical door sealing surface-cleaning apparatus shown diagrammatically in the figure and indicated by the references 6 and 6'. These sealing-surface cleaning apparatus are identical in form and only one of them will be described in detail hereinafter.

The cleaning apparatus 6 is mounted upon the carriage of a pusher machine 7 adapted to travel on rails 8 alongside the battery 1 in the usual manner whilst the sealing-surface cleaning apparatus 6' is carried on the coke guide machine 9 of the battery, this machine travelling on rails 9' also in the usual manner.

In this case, however, both the pusher machine and the coke guide machine are constructed so as to be capable of receiving not only the said door sealing surface-cleaning apparatus but also apparatus for cleaning the sealing surfaces of the door frames in the ends of the ovens, this cleaning apparatus being indicated in FIGURE 1 of the drawings by the references 10 and 10' respectively. As the two apparatus 6 and 6' and the two apparatus 10 and 10' are identical, reference will hereinafter be made only to one of each of these apparatus.

The door frame sealing surface cleaning apparatus is illustrated in FIGURES 2 to 6. This apparatus effects the scraping of the sealing surfaces in a downward direction from the upper parts of such sealing surfaces to the bottom thereof so that the removal of the deposits is always assisted by, and not opposed by, the force of gravity.

Referring to FIGURES 2 to 6 it will be seen that the apparatus there illustrated comprises a framework 40 mounted on the carriage of the coke machine 9, this framework 40 carrying a pair of horizontal rails 41 arranged at right angles to the direction of travel of the pusher machine and coke guide machine.

On these rails is mounted a separate carriage 42 adjustable to and from the coke battery 1. The carriage 42 may be adjusted on the rails 41 in any suitable manner as, for example, by a screw 43 and nut assembly 44 shown in the drawings or by electrical or hydraulic means.

An oblong frame 45 carried by transverse members 46 is mounted on guide brackets 47 on the carriage 42 so as to be capable of slight movement to and from this carriage against the pressure of spring devices diagrammatically illustrated at 48. In the frame 45 is a vertical reciprocable scraper carriage 49 carried by rollers 50 operating in the vertical sides of the frame 45 which act as guide rails for the carriage.

The scraper carriage has a transverse beam 51 to the upper side of which is fixed one end of each of two laterally spaced roller chains 52 having their other ends secured to the underside of the beam 51 and between its ends passing upwardly and over chain sprockets 53 and downwardly and under chain sprockets 54, the sprockets 53 being fixed upon a horizontal shaft 55 journaled in bearings at the top of the frame 45 and the sprockets 54 being fixed upon a shaft 56 journaled in bearings at the bottom of the frame 45. The shaft 56 is driven by an electric, hydraulic or other appropriate motor 57 fixed to the lower part of the frame 45 as seen in FIGURES 3 and 6, the drive being transmitted from the motor through an endless chain 58 and chain sprockets 59 and 60 respectively on the motor shaft and the shaft 56.

The scraper carriage 49 carries a scraper assembly generally indicated by the reference 61. This assembly comprises a pair of U-shaped brackets 62 arranged one near each end of the beam 51 of the scraper carriage 49 and furnished on its rear surface with a boss 63 and coaxial

stud 64, the boss 63 being received within a horizontal socket 65 fixed in the web of beam 51 and the boss 63 being free to slide axially in said socket against the restraint of a compression spring 66 surrounding the stud 64. Thus the brackets 62 are yieldingly urged forwardly from the carriage 49. Each of the brackets 62 is furnished with a central lug 67 to which is fixed a forwardly projecting limb 68 (see FIGURES 3, 4 and 5) constituting a profiling or limit scraper which is adapted to enter the door opening in the door frame 3' and to remove hard deposits on the frame and to prevent such deposits building up sufficiently to interfere with the proper entry of the oven door into the frame.

Between the upper ends of the two brackets 62 at opposite ends of the beam 51 extends a scraper bar 69 having at its front edge and at each end a downwardly and forwardly directed knife edged scraper blade 70 primarily intended to effect the scraping of the vertical or side portions 71 of the sealing surface of the door frame 3'. A similar scraper bar 72 is carried by the lower ends of the brackets 62 and has a downwardly and forwardly directed knife edged scraper blade 73.

Between each pair of end scraper blades 70 and 73 is secured a further downwardly and forwardly directed knife edged scraper blade, respectively marked 74, 74', bolted to the scraper bars 69 and 72 respectively in a forwardly and rearwardly adjustable manner. The blades 74 and 74' could be made integrally with the blades 70 and 73 respectively but are preferably made separately because the blades 70 and 73 receive more wear than the blades 74 and 74', as the former have to scrape the long side surfaces of the side sealing surfaces of the door frame whereas the blades 74 and 74' only respectively scrape downwardly the top and bottom horizontal faces of the door frame.

As will be seen from the drawing, means are provided for heating the scraper blades, such means being, in the example illustrated, in the form of aerated flame gas burners 75.

The operation of the door frame scraping mechanism will be clear from the drawings and the above description, the carriage 49 being taken to the top of the door frame 3 or 3' and then caused to descend to the bottom of the door frame when the scrapers effect the scraping of the top horizontal sealing surfaces, then the side sealing surfaces of the frame and finally the bottom horizontal sealing surfaces of the frame, the scraping always being downwardly and uni-directional without an upward component and never opposed to the force of gravity.

It will be appreciated that the lower horizontally extending sealing surface of the door frame is scraped solely by the lower scraper blades 73 and 74', whilst the upper horizontally extending sealing surface of the door frame is scraped solely by the upper scraper blades 70 and 74.

Assuming that a door 5 has been moved from its frame 3' and introduced into its sealing surface cleaning apparatus 6', then the carriage 9 of the coke guide machine may be adjusted along its rails 9' to bring the appropriate door frame cleaning apparatus 10' into alignment with the oven from which the door has been removed and then the separate door frame cleaning apparatus-carrying carriage 42 advanced along its rails 41 to bring the scraping blades 70, 74 and 73, 74' into scraping engagement with the sealing surface 71 of the door frame with the carriage 49 at the top of its stroke, the scraper blades being pressed yieldingly into engagement with the said sealing surfaces and the carriage 49 then caused to descend for its full stroke to effect the cleaning of the said sealing surfaces 71, whereafter the carriage 42 is withdrawn and the scraper carriage 49 returned to its upper position ready for another scraping operation.

It will, of course, be understood that the rails 41 for the carriage 42 will be extended from the coke guide machine as far as is necessary to enable the door frame cleaning apparatus to be brought into an appropriate

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cleaning position with respect to the door frame.

It will be appreciated that with apparatus constructed in accordance with this invention and as above described, the coke oven doors at the opposite ends of an oven may be withdrawn by the door extracting and replacing heads 15, swung through a right angle and introduced into the door sealing surface-cleaning apparatus 6 and 6' respectively so that the sealing surfaces of the doors can be mechanically cleaned. Then the coke guide 76 can be registered with one end of the oven whilst the pusher ram 77 is registered with the other end of the oven and the later "pushed." After completion of the pushing operation (or if desired before), the door frame cleaning apparatus 10, 10' can be registered with the ends of the oven and the sealing surfaces of the door frames 3, 3' cleaned thereby, the apparatus 10, 10' then being withdrawn and the pusher and coke guide machines finally brought back into position for the return of the doors 4, 5 to the oven.

Although in the embodiment of the invention above described the apparatus for mechanically cleaning the sealing surfaces of the door and the apparatus for mechanically cleaning the sealing surfaces of the door frame at each end of the oven are said to be carried on the carriage of the pusher machine and coke guide machine, it should be understood that these mechanisms could, if desired, be arranged on carriages independent of the pusher machine and coke guide machine.

We claim:

1. Apparatus for cleaning self-sealing metal surfaces on a door frame for a horizontal coke oven door, comprising: a main carriage movable alongside a battery of coke ovens into position for cleaning self-sealing surfaces aforesaid on a door frame of the ovens of said battery; an auxiliary carriage mounted for transverse movement

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relative to that of said main carriage into and out of cleaning relation with said sealing surfaces; mechanical sealing surface cleaning means movably mounted on said auxiliary carriage for cleaning movement along said sealing surfaces; and means for moving said auxiliary carriage and its sealing surface cleaning means into and out of sealing surface cleaning relationship with said sealing surfaces, wherein the cleaning means comprises: oppositely disposed blades for the vertical sides of a door frame and intermediate blades between the blades for the vertical sides of the door frame for cleaning the sealing surfaces of top and bottom horizontal members of the door frame, all said blades being mounted for up and down movement in unison on the auxiliary carriage for cleaning of the surfaces.

2. Apparatus according to claim 1, wherein the cleaning means further comprises: elements constituting a profiling scraper which is adapted to enter the door opening in a door frame alongside the two vertical sides of the frame of a door to remove hard deposits on the frame and to prevent such deposits building up sufficiently to interfere with the proper entry of the oven door into the frame.

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