ABSTRACT: A door for a self-cleaning oven is provided with a window which is closed when the door is locked for self-cleaning of the oven, thereby preventing heat losses through the window during self-cleaning. The window closing means comprises a series of rotatable flat plates, movable from a mutually parallel disposition, in which the window is open, to a disposition in which they are all disposed in the same plane parallel to that of the window, thereby obstructing the window, operable in response to movement of the door locking mechanism.
The present invention relates to shutter means for closing or obstructing the window which is normally found in the oven doors of domestic cooking appliances.

For many years, the cook stove manufacturing industry has provided its oven doors with windows through which the housewife may observe the cooking process which is being carried on within the oven without the necessity of opening the oven door as was previously required.

More recently, the cook stove manufacturing industry has developed various forms of an oven which may be heated to a relatively high temperature for the purpose of cleaning food soil from the interior oven walls by pyrolysis. The temperatures which are involved in the pyrolytic cleaning action are substantially higher than those which are encountered in normal cooking operations. Normal cooking temperatures do not, as a rule, exceed 500°F. to 550°F. whereas the pyrolytic cleaning action takes place somewhere between 800°F. and 1,000°F.

Initially, it was believed that it would be necessary to sacrifice the presence of a window in the oven door in order to achieve the obvious advantages of the “self-cleaning” feature and the high temperatures. The reason for this is that the conventional double-pane window design of the prior art is not capable of confining the increased amount of heat energy to the oven cavity and, accordingly, the heat loss through the window was excessive and radiation through the window presented a hazard to the housewife.

The present invention, however, makes it possible to retain the advantages of a window in the oven door while, at the same time, providing simple and automatic means whereby, during the high temperature self-cleaning cycle, the window may be obstructed so as to retain the high temperature within the oven and to prevent both excessive heat loss and radiation through the window.

According to the present invention, in one embodiment, an oven door window is provided with a peripheral frame within which are mounted a plurality of spaced, parallel, substantially flat blades, rotatable about their longitudinal axes from a first position in which the flat blades are parallel to one another and normal to the plane containing the window so that the interior of the oven may be viewed between the blades, to a second position wherein the blades are rotated through substantially 90° so as to lie in substantially a single plane parallel to the plane of the window whereby the window is completely obstructed and closed by the blades, operating means being provided to simultaneously move all of the blades as a result of a driving locking function which is a precedent to the initiation to the self-cleaning cycle.

A preferred embodiment of the invention will now be disclosed in detail with reference to the accompanying drawings in which like parts are denoted by like reference numerals in the various views and in which:

FIG. 1 is a perspective view, partly cut away and exploded in order to show an oven door embodying a shuttered window constructed and arranged in accordance with the present invention;

FIG. 2 is a section view taken along line 2--2 of an assembled door as illustrated in FIG. 1;

FIG. 3 is a fragmentary detailed view of a portion of the shutter actuating mechanism illustrated in FIG. 1;

FIG. 4 is a fragmentary detailed view showing the components of FIG. 3 assembled and in a different position; and

FIG. 5 is a fragmentary view showing a portion of the shutter actuating element.

Turning now to FIGS. 1 and 2, an oven door embodying the shuttered window of the present invention is illustrated. In FIG. 1, the door may be seen to comprise an inner shell 10 having flanged edges which will engage with an outer shell 11. Conveniently, the outer shell 11 is provided with flanged edges, the lower such edge being provided with tabs 12 which may be received in slots 13 in the corresponding edge of the inner shell 10 to secure the two shells together along the lower edge. The upper edges may then be secured together by means of screws such as 14 received in corner brackets 15 carried by the upper corners of the outer shell 11 of the door.

As seen in FIG. 2, the inner shell 10 is also provided with a rearwardly extending sheet metal plug or boxlike portion 16 which is of a size such that it will fit relatively snugly within the opening to the oven. The oven opening is indicated in dotted lines in FIG. 2 by the oven upper wall 17 and the oven bottom wall 18.

The plug or boxlike member 16 is secured to the rearward face of the inner shell 10 by brackets 16a and is provided with a heat resistant, compressible seal member 19 so that the oven door, when in its closed position, will tightly close the oven opening with the boxlike section 16 extending slightly into the oven cavity.

The rear face of the plug 16 is provided with an aperture defined by a peripheral flange 20, the flange 20 receiving a sheet of heat resistant glass 21 such as that sold under the trade mark "Pyrex."

The outer shell 11 of the door is also provided with an opening defined by an inwardly extending peripheral flange 22, this flange engaging the rim 23 of a frame 24 which mounts a pair of spaced, parallel panes of glass in a self-contained unit which is of conventional construction.

The plug or boxlike section, interiorly of the glass pane 21 presents a recess aligned with the three panes of glass constituting the window in the door within which the shutter mechanism is mounted.

In FIG. 1, the shutter mechanism will be seen to comprise a channel-section frame 25 which defines a rectangular opening substantially coextensive with the size of the panes of glass constituting the window. The frame 25 comprises side members 26 and 27 and a bottom member 28 and a top member 29. The frame is secured in position by means of brackets 30 which may be spot welded to the inner surface of the plug or boxlike member 16. Angular brackets 31 are then secured to the brackets 30 by means of screws so that one free end may bear upon one flange of the channel-section frame member and retain it in position. As seen in FIG. 2, the frame members (only 28 and 29 of which are shown) serve also to retain the pane of glass 21 within the flange 20.

Bottom and top frame members 28 and 29 are provided with a plurality of spaced and aligned apertures 32 by means of which the spaced, parallel, substantially flat blades 33 may be mounted as shown in FIG. 1. The blades are capable of rotating through 90° from a first position as shown in FIG. 1, in which they are parallel to one another and normal to the panes of glass so that a housewife may see through the window to a position in which the flat blades 33 are substantially coplanar and parallel to the panes of glass as shown, in a fragmentary view, in FIG. 3.

Turning now to FIGS. 3 and 4, each of the blades is formed from a length of extrusion, conveniently of aluminum, defined by a central rib portion 34 from which extends, on both sides, the blade portion 35 and 36. One of the blade portions 36 is provided with an offset segment 37 along its edge so that, as seen in FIG. 3, the end of blade portion 35 may lie within the offset portion 37 of an adjacent blade, thereby enabling the blade portions of adjacent blades to be coplanar when they are in the position shown in FIG. 3.

At the lower end of the blades (not shown in detail), each blade is provided with a pin inserted in a central bore 38 in the central rib 34 and such pin is then inserted through the aperture 32 in the bottom frame member 28. A pin 39 of the kind just described may be seen in FIG. 2.

Each of the blades 33 is provided, at its upper end, with a cranked pin 40 having a lower portion 41 adapted to be inserted in the bore 38. Small tabs 42 may be struck from the material of the pin 40 and these tabs may be received in slots 43 in the bore 38 so as to fix the cranked pin 40 relative to the blade 33 to resist rotation relative thereto. The upper portion of the cranked pin 40 is offset as at 44.
The blades 33 are pivotally mounted in the upper frame member 29 by passing through apertures 45 provided therein aligned with apertures 32 in bottom frame member 28.

The offset portions 44 of the cranked pin 40 are then received in a plurality of apertures 46 in a slideable plate 47 lying above frame member 29 and linking the offset portions 44 of all of the cranked pins 40 associated with each of the blades 33.

From the construction so far described, it will be apparent that the sliding plate 47 may be reciprocated to move the blades, in unison, from the position shown in FIG. 3 to the position shown in FIG. 4 and vice versa.

The movement of the sliding plate 47 is achieved by a mechanism disclosed in FIG. 1.

First, the sliding plate 47 is supported in slotted tabs 48 carried by the upper frame member 29 and, centrally of its length, is provided with an operating arm or extension 49.

Secured to the inner door shell 10 is a mounting bracket 50 upon which is pivotally carried a downwardly extending lever 51 to which is welded, at 52, a spring steel element 53 which extends upwardly to position a horizontally disposed portion 54 immediately inside and below an elongated horizontal slot 55 formed in the inner door shell 10.

The oven construction with which the door is associated is provided with a door locking element comprising a rod 56 having a formation of a hooked end 57 which projects through the portion 58 of the stove construction and which is positioned so that it will enter the elongated horizontal slot 55 when the door is in the closed position. As long as the hooked portion 57 is in the horizontal position shown in FIG. 1, the door may be freely opened and closed without interference.

However, when the high temperature, self-cleaning, pyrolytic cycle is initiated, the shaft 56 is rotated through substantially 90° in the direction of the arrow 59 with the door in the closed position. The hooked portion 57, during this rotation, will encounter the horizontal portion 54 of the element 53 which will be pressed downwardly, thereby causing the lever 51 to pivot to the right about pin 60 as seen in FIG. 1.

Turning now to FIG. 5, lever 51 may be seen to be provided with a forwardly projecting tab 61 at its lower end, provided with an aperture 62 within which is received the hooked end 63 of the stiff wire 64. The stiff wire 64 engages operating arm 49 of the sliding plate 47. The arm 49 is provided with an upwardly bent portion 65 at its free end and this portion 65 is slotted at 66, the slot passing entirely through the element 45 and a short distance into the horizontal extent of the arm 49.

The stiff wire 64 is provided with a suitably located crook at 67 which engages the slot 66 and, thereby, is firmly secured to the arm 49. The end 68 of the wire 64 is either formed into or secured to a tension spring 69, the free end of which is mounted to a bracket 70 carried by the inner door shell 10.

The spring 69 will constantly urge the arm 49 and, therefore, the sliding plate 47 to the left, as seen in FIG. 1 and will urge, therefore, the shutters or blades 33 to the “open” position as shown in FIG. 1. This position is determined by a stop constituted by a tab 71 struck up from the material of the sliding plate 47 which engages the slotted bracket 48 within which the sliding plate 47 is received.

When the door is closed and shaft 56 is rotated through substantially 90° to lock the door, the hooked end 57 of the door locking element will, in addition to engaging the interior surface of the inner door shell 10 to thereby lock it in the closed position, also depress the horizontal element 54, swing the lever 51 to the right as seen in FIG. 1, slide the sliding plate 47 to the right as seen in FIG. 1 and move the blades 33 from the position shown in FIG. 4 to the position shown in FIG. 3, thereby effectively shutting the oven door window in a manner which will make it possible for the windowed door to retain the high temperatures within the oven for the self-cleaning cycle and to reduce the heat loss and radiation through the window to an acceptable level.

We claim:

1. An oven door having a window and obstruction means for the window, the obstruction means comprising a peripheral rectangular frame, a plurality of spaced, parallel, substantially flat blades mounted within the frame for rotation about their longitudinal axes between a first, open position in which the blades lie in parallel planes, each normal to the plane of the window and a second, closed position in which the blades lie substantially in a single plane parallel to the plane of the window, the means mounting the blades for rotation within the frame comprising, at one end of each blade, a pin extending axially of the blade through one side of the frame and then extending transversely thereof to a pivotal attachment with an operating plate extending the length of the said one side of the frame and linking all the said pins together to rotate in unison, rotatable means for locking the door in its closed position having a formation which will pass through a registering slot in the door in an unlocked angular position of the element but which will not pass through the slot in a locked angular position of the element, cam means within the oven door adjacent the slot and engaged by the door locking element when in its locked angular position, said cam means being mounted for rotation on the door structure, an arm extending from the cam means and connected to the operating plate, rotation of the cam means being converted thereby to reciprocation of the operating plate to move, in unison, the blades from their first open position to their second closed position, upon rotation of the door locking element to its locked angular position within the door.

2. An oven door as claimed in claim 1 wherein means are provided to bias the blades to their first open position.

3. An oven door as claimed in claim 2 wherein the means to bias the blades to their first open position comprises a tension coil spring extending between one end of the operating plate and standing structure on the oven door.