March 9, 1943. G. L. REES 2,313,582

DOOR STRUCTURE

Filed March 4, 1941

Fig. 1.

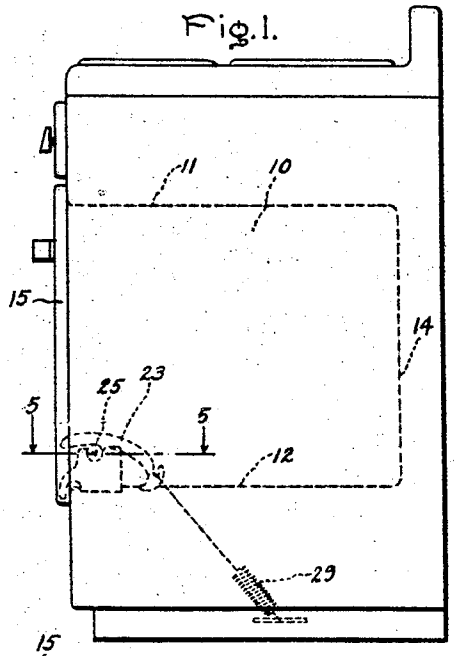


Fig. 4.

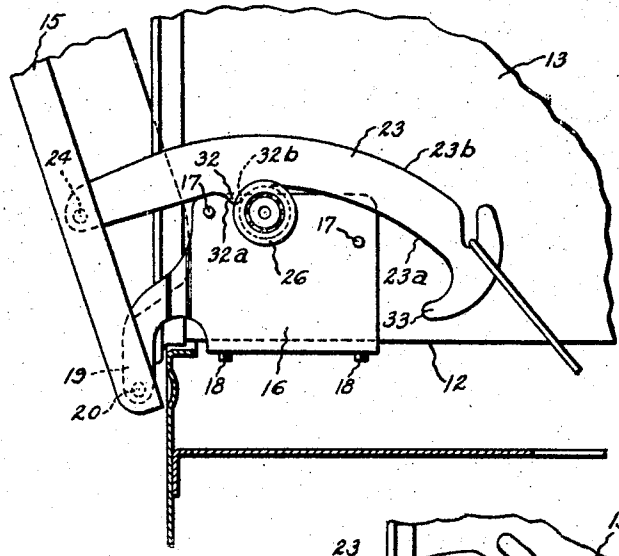


Fig. 2.

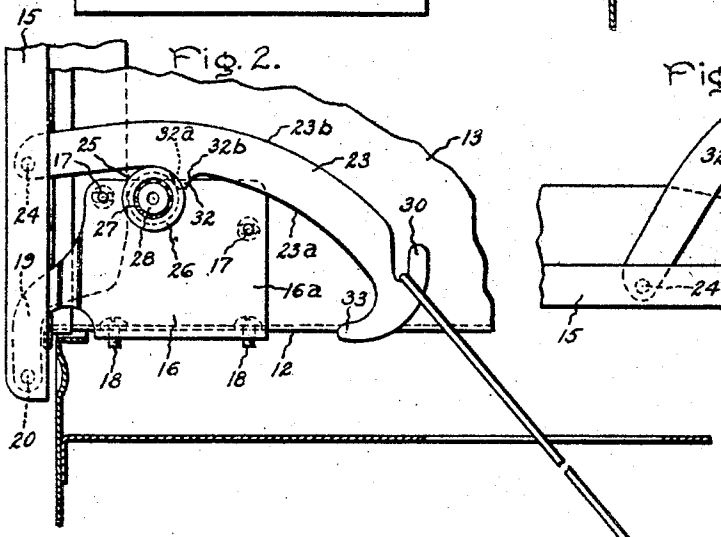
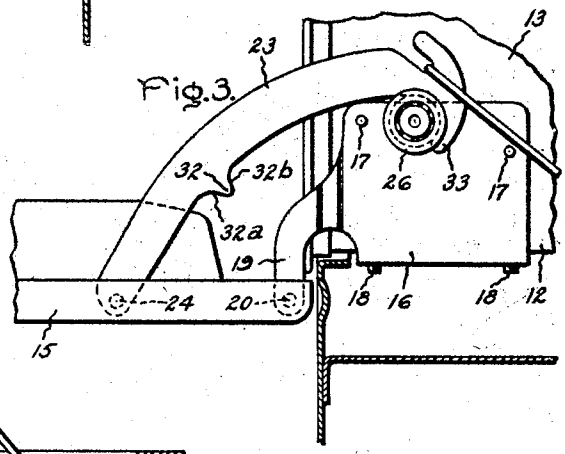


Fig. 3.



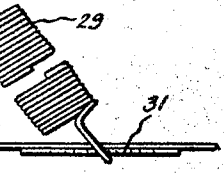
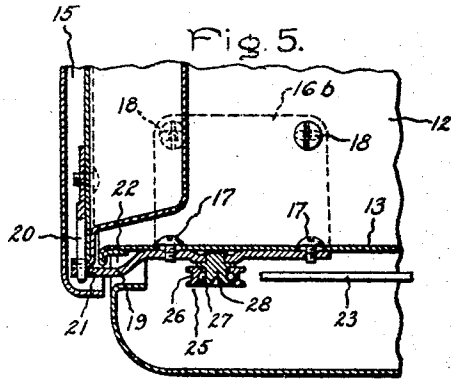


Fig. 5.



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2,313,582

DOOR STRUCTURE

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8 Claims. (Cl. 126—194)

This invention relates to door structures, more particularly to a door structure having a drop door that swings between a substantially closed vertical position and a substantially horizontal open position, and it has for its object the provision of an improved door structure of this character.

While not limited thereto, this invention is particularly applicable to drop oven doors and the like. It is important in an oven door structure that the door be tightly closed when baking so as to prevent the loss of heat at the front. It is also important to limit the downward movement of the door to its horizontal open position; and also, when broiling to hold the door in a partially open position so as to permit hot gases to escape rapidly from the oven.

This invention contemplates a drop oven door structure provided with improved mounting means for the door and means for counter-balancing the door as it is moved between its positions. The parts are so arranged that the door when closed is fitted closely to the oven lining, and is yieldingly held in this position by the counter-balance structure. Also, the counter-balance means yieldingly holds the door in its partially open broil position against the bias of the counter-balance means. Moreover, the counter-balance means is arranged to positively prevent movement of the door in a downward direction beyond its horizontal open position.

In accordance with this invention, the door is provided with hinge mounting means that support the door directly from the lining of the oven itself, as distinguished from some other part of the range removed from the lining. This eliminates to a large extent manufacturing variables, thereby making it possible to fit the door surfaces and the front edges of the lining walls more accurately. The hinge means are adjustably fitted to the lining so that the door can be adjusted to a good fit when the oven is hot.

The counter-balance means includes a suitable link that is pivotally connected at one end to the door and at its other end to a spring which applies a force to withdraw the link and thereby bias the door to its closed position. The link is moved outwardly and inwardly as the door is moved to its open and closed positions, and it is supported for this movement upon a suitable fulcrum which also is attached directly to the oven lining. Preferably, this will be accomplished by mounting the fulcrum on a fixed part of the hinge means that is attached to the lining. The link, spring, and fulcrum are so arranged that the spring force continuously counter-balances the weight of the door. Also, the link is provided with surfaces that engage the fulcrum when the door is closed, and when it is partially open so as to yieldingly hold the door in each of these positions. The link is also provided with an abutment or stop which engages the fulcrum so as to limit the downward movement of the door to its horizontal open position.

For a more complete understanding of this invention, reference should be had to the accompanying drawing in which Fig. 1 is a vertical end elevation of a range having an oven, the door of which is provided with a counter-balance structure arranged in accordance with this invention; Fig. 2 is an enlarged fragmentary sectional view taken through a portion of the range of Fig. 1 and illustrating the door in its closed position; Fig. 3 is a view similar to Fig. 2, but illustrating the door in its completely opened position; Fig. 4 is a view similar to Figs. 2 and 3, but illustrating the door in its partially open or broil position; and Fig. 5 is an enlarged sectional view taken through the line 5—5 of Fig. 1 and looking in the direction of the arrows.

Referring to the drawing, I have shown my invention in one form as applied to the drop door of an oven of a range. As shown, the range is provided with an oven 10 which has an inner top wall lining 11, an inner bottom wall lining 12, inner side wall linings 13 (only one of which is shown), and an inner rear wall lining 14. The oven is open at the front. This open front is normally closed by a door 15. The door 15 is hinged at its lower edge to swing from a completely closed vertical position, as shown in Figs. 1, 2 and 5, to a completely open horizontal position, as shown in Fig. 3. For this purpose, a pair of hinge brackets 16 is provided, one on each side of the oven; only one of these brackets is illustrated. Each hinge bracket is L-shaped in vertical cross section; as shown, it has a vertical leg 16a fastened directly to the associated side wall lining 13 of the oven in any suitable manner, as by means of screw fastening devices 17, and a horizontal leg 16b fastened to the bottom wall lining 12, as by means of screw fastening devices 18. The fastening devices 17 and 18 extend through horizontally elongated openings in the wall linings 12 and 13 respectively, and are received in tapped holes provided for them in the bracket 16. The brackets, therefore, may be adjusted backwardly and forwardly with reference to the front of the oven.

Each bracket 16 is provided with a forwardly

and downwardly extending lug 19 to which the door is pivotally secured in any suitable manner, as by means of a pin 20 fastened to the door and received in an aperture 21 provided for it in the lug. It will be understood that the lugs 19 will be projected forwardly through suitable openings 22 provided for them in the front wall of the range.

Because the brackets 16 are adjustable with reference to the front of the oven, the door can be nicely fitted to the front of the oven. Of course, the door and oven are assembled while at room temperature. Inasmuch as it is desirable that the door fit firmly against the oven lining when the oven is hot, the door fit is rechecked after the oven has been heated. If at this time the door does not fit tightly against the lining, the screws 17 and 18 are loosened, and the brackets adjusted so that the door fits properly against the lining, after which the screws are tightened.

The counter-balance structure arranged in accordance with this invention comprises a suitable link or cam 23 which is pivotally connected at its forward end to the door in any suitable manner, as by means of a pin 24 secured to the door and received in a suitable aperture provided for it in the link. The link is constructed and arranged to move upon a suitable fulcrum 25 which as shown is in the form of a roller mounted upon the hinge bracket 16. It is to be noted that generally two links may be used, one on each side of the oven, but only one is necessary, and of course when only one is used, the fulcrum 25 will be located on the side of the oven where the link is located. As shown, the fulcrum is in the nature of a roller 26 mounted upon suitable ball bearings 27 which rotate in a fixed race 28 that is rigidly secured to the bracket 16. Preferably and as shown, the surface 23*a* of the link which engages the roller will be concave, and generally it is desirable that the opposite surface 23*b* of the link also be given a concave form.

Attached to the rear end of the link 23 is a suitable tension counter-balance spring 29. One end of this spring is provided with a loop that is anchored to a hook 30 formed in the rear end of the link 23, while the other end of the spring is adjustably anchored in one of a series of holes in a fixed member 31. This other end of the spring is positioned considerably below the link, as clearly shown in Figs. 1 and 2, so that it biases the rear end of the link inwardly and downwardly, as viewed in the drawing, to bias the door toward its closed position and to balance the door to prevent it from falling rapidly to its open position by reason of its gravity bias.

Intermediate its ends the link is provided with a downwardly extending protuberance 32 which is provided on opposite sides with curved surfaces 32*a* and 32*b*. These surfaces are arranged to engage the roller 26 so as to yieldingly hold the door in its closed position shown in Fig. 2, and in its partially open broil position as shown in Fig. 4. When the door is closed the surface 32*a* engages the roller, as shown in Fig. 2, to yieldingly hold the door in its closed position firmly against the front edges of the oven lining. In order to open the door, it is necessary to apply sufficient force to the door to elevate the link sufficiently to permit the downward protuberance 32 to ride over the roller so that its other curved surface 32*b* at the rear of the protuberance engages the roller, as shown in Fig. 4. When the door is in this partially open position of Fig. 4 and the link 23 is in its position of this figure, the surface 32*b* of the protuberance 32 engages the roller as shown so as to yieldingly hold the door in this position, and prevent the spring 29 from pulling the door closed.

In order to close the door it is necessary to apply such a force to the door as to elevate the link 23 to permit the protuberance to ride over the roller 26. In each case, it will be understood of course that the spring 29 draws the link downwardly on the roller to apply the yielding force to the link.

The link is provided at its rear end with a downwardly extending curved hook 33 which is arranged to engage the roller when the door is in its fully open horizontal position of Fig. 3 so as to prevent further downward movement of the door. It will be understood that when the door is in this position, its gravity bias would tend to pull the door on downwardly against the force of the spring 29 if the hook member were not provided. In other words, as the door is being moved from its closed to its open position at some point in its travel downwardly, the gravity bias overcomes the force of the spring and would move the door beyond its horizontal position if it were free to do so.

From the foregoing description, it will be understood that in the operation of the counter-balance structure when the door is closed, as shown in Fig. 2, it is yieldingly held in this position by the curved surface 32*a*; when it is in its broil position of Fig. 4, it is yieldingly held there by the curved surface 32*b*; and when it is in its fully open position of Fig. 3 it is secured against further downward movement by the hook 33. As the door is moved between its various positions, the concave surface 23*a* rides upon the roller 26, and the spring 29 functions to substantially balance the weight of the door.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a door structure having a door movable between at least two positions, a counter-balance for the door comprising a link attached to the door so as to be moved with it, a fulcrum, said link having one edge moving upon said fulcrum as the door is moved to said positions, biasing means attached to said link so as to resist its movement in one direction to resist the movement of the door to one of said positions, and said link being constructed with two spaced projecting surfaces on said edge to engage said fulcrum so as to yieldingly hold the door in each of said positions.

2. A counter-balance and positioning structure for a pivoted member movable between first and second extreme positions and biased to the first of said positions comprising a link having one end pivotally connected to said member, a fulcrum for said link upon which an edge thereof moves as said member is moved between said positions, a spring attached to the other end of said link biasing it to the second of said extreme positions and positioned to force said link against said fulcrum, said link having a projecting surface on its edge that engages said ful-

crum when said member is in said second position and riding over it when said member is moved to said first position, whereby it yieldingly holds said member in said second position, and said link also having a second projecting surface on said edge spaced from said first projecting surface for engaging said fulcrum when said member is moved to said first extreme position to prevent movement of said member beyond said position, and said link further having a third projecting surface on said edge spaced from said other projecting surfaces for engaging said fulcrum so as to yieldingly hold said member in a position intermediate said extreme positions.

3. A counter-balance structure for an oven door and the like that is pivoted at its lower edge to move from a substantially vertical closed position to a substantially horizontal open position comprising a roller mounted for rotation on a fixed axis, a link having a concave surface movable upon said roller, means pivotally connecting one end of said link to the door, a spring attached to the other end of said link biasing the door to its closed position, said other end being provided with a downward extension provided with a curved surface for engaging said roller to limit the downward movement of the door to its horizontal open position, and said link also being provided with a downward extension intermediate its ends, said extension having curved surfaces on its sides, one to engage said roller so as to yieldingly hold the door in its closed position, and the other to engage the roller to yieldingly hold the door in a partially open position.

4. A door structure for an oven provided with top, bottom, rear and side wall linings defining a heating chamber with a front opening therein, comprising a door for closing said opening, hinge brackets for said door mounted directly upon the lower parts of said side wall linings for adjustment forwardly and backwardly with reference to the front of said chamber, means pivotally connecting said door to said brackets so that it swings on a horizontal axis between opened and closed positions, a link having one end pivotally connected to the door at one side, a fulcrum for said link mounted on the hinge bracket at said side, a spring attached to the other end of said link so as to apply a force to the link in such a direction that the door is biased to its closed position, said link having a curved surface that engages said fulcrum when the door is in said closed position to yieldingly hold the door closed, and a second surface that engages said fulcrum to limit the movement of the door in a downward direction.

5. A counter-balance structure for a door provided with fixed pivots at its lower edge supporting it for movement from a substantially vertical closed position to a substantially horizontal open position comprising a link having one end pivotally connected to said door, a fulcrum upon which one edge of said link rides, a spring attached to the other end of said link so as to apply a force to said link in such a direction as to force it downwardly on said fulcrum and to bias the door to its closed position and thereby counter-balance the weight of the door as it is moved to its open position, said link having a downwardly projecting surface on said edge for engaging said fulcrum when said door is in its closed position so as to yieldingly hold said door closed, a second downwardly projecting surface on said edge for engaging said fulcrum to prevent the movement of the door in a downward direction beyond its substantially horizontal open position, and a third downwardly projecting surface on said edge opposite said first projecting surface for engaging said fulcrum so as to yieldingly hold the door in a position intermediate its horizontal open and vertical closed positions.

6. A door structure for an oven provided with inner wall linings defining a heating chamber with a front opening therein comprising, a door for closing said front opening, hinge brackets for said door mounted directly upon said wall linings, a link attached to said door, a fulcrum mounted on one of said hinge brackets upon which said link slides, biasing means attached to said link so as to resist movement of the door to its open position, and means on said link engaging said fulcrum so as to yieldingly hold said door in its closed position.

7. A door structure for an oven provided with top, bottom, rear and side wall linings defining a heating chamber with a front opening therein comprising, a door for closing said opening, hinge brackets for said door mounted directly upon the lower parts of said side wall linings, means pivotally connecting said door to said brackets so that it swings downwardly on a horizontal axis from a substantially vertical closed position to an open position, a link having one end pivotally connected to the door at one side, a fulcrum for said link mounted on the hinge bracket at said side, a spring attached to the other end of said link so as to apply a force to the link in such a direction that the door is biased to its closed position, said link having a surface that engages said fulcrum when the door is in said closed position to yieldingly hold the door closed, and a second surface that engages said fulcrum to limit the movement of the door in a downward direction.

8. A door structure for an oven provided with walls defining a heating chamber with a front opening therein comprising, a door for closing said front opening, hinge brackets for said door, means pivotally connecting said door to said brackets so that it swings on a horizontal axis between opened and closed positions, a link having one end pivotally connected to said door at one side, a fulcrum for said link mounted on said hinge bracket at said side, a spring attached to the other end of said link so as to apply a force to said link in such a direction that the door is biased to its closed position, said link having a surface that engages said fulcrum when said door is in said closed position to yieldingly hold the door closed, and a second surface that engages said fulcrum to limit the movement of the door in a downward direction.

GREGORY L. REES.