

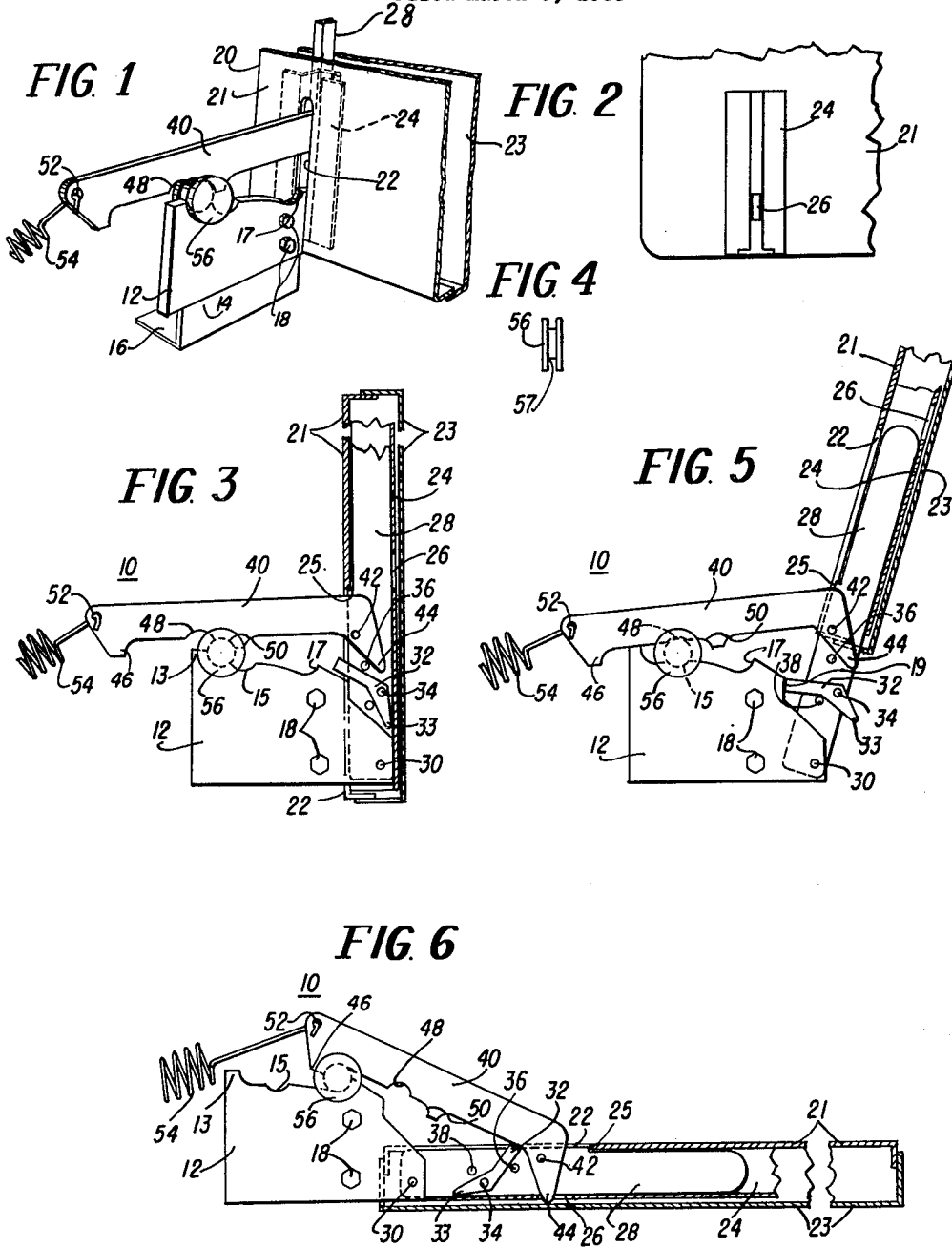
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HINGE STRUCTURE

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HINGE STRUCTURE

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This invention relates to door structures and more particularly it relates to hinge structures for "drop" doors, that is, doors that swing between a substantially vertical closed position and a substantially horizontal open position.

This invention is particularly applicable to drop oven doors, and while it is described in this environment in this specification, it is to be understood that this is for the purpose of description only and is not to be a limitation.

In the case of drop oven doors, it is important that the door be tightly closed when baking 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. With electric ranges, the door must be held in a partially open position when broiling in order to permit hot gases to escape rapidly from the oven, otherwise the thermostat will operate and shut off the broiling unit. Another feature which is desirable but which is not important to the function of the oven door, is to have the oven door removable to permit the oven and the oven door both to be easily cleaned.

Numerous prior art references may be found disclosing hinge structures for drop oven doors providing one or more of the features set forth above. However, each of these hinge structures generally has some undesirable characteristic. For example, those having removable doors generally are undesirable because the doors are not easily removed. That is, the doors are fastened to the hinges supporting them by means of catches or the like and these catches must be operated before the door can be removed. Furthermore, many of the hinge structures disclosed by these references do not have any convenient way of holding the hinge structure in an open position so that the door can be easily replaced. When the door is removed, the hinge structure is often withdrawn back into the oven structure due to the action of the biasing spring which counterbalances the door, an action which is well known in the art. It is therefore necessary, in some way, to hold the hinge structure in an open position so that the door may be replaced and, at the same time, replace the door. If the door is fastened to the hinge structure with catches or the like, the difficulty encountered is obvious.

Also, these hinge structures generally have a roller, a ball bearing assembly or a slide which is rigidly secured to a bracket on the hinge structure, the purpose and function of which is well known in the art (for example, as a fulcrum for parts of the hinge structure). These rollers, ball bearing assemblies and slides sometimes have a tendency to bind, creating considerable friction. Furthermore, they generally require lubrication. In some cases, the supporting brackets are broken off of the hinge structure and must be replaced, necessitating an expensive repair bill.

It is therefore the principal object of this invention to provide a new and improved hinge structure for drop doors.

It is a further object of this invention to provide a new and improved hinge structure for drop doors which provides three positions for said drop doors; a substantially vertical closed position; a partially open broil position; and a substantially horizontal open position. In this respect, it is a still further object to provide for the easy removal and replacement of said door in a pre-

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determined position, and still to provide means for preventing the removal of said door in any other position.

It is a still further object to provide a new and improved hinge structure which is virtually frictionless and troublefree.

It is a still further object to provide a new and improved hinge structure which is less expensive to manufacture.

It is a still further object to provide a new and improved hinge structure which eliminates installation difficulties encountered with prior hinge structure for drop doors.

These and other objects of this invention as well as the novel features thereof will be readily apparent from a reading of the following specification taken in conjunction with the drawing, in which:

FIG. 1 is a perspective view showing the hinge structure of this invention in its operative relationship with a drop oven door, with the oven door being only partially shown;

FIG. 2 is a partial view of the back panel of the drop oven door, showing the channel-forming member connected thereto;

FIG. 3 is a side view of the hinge structure in the closed position;

FIG. 4 shows the construction of the roller;

FIG. 5 is a side view showing the hinge structure in the broil position, and the position of the hinge structure when the oven door is removed; and

FIG. 6 is a side view showing the hinge structure in the fully open position.

Referring now to the drawing, hinge structure 10 includes a support, preferably of L-shaped construction, having a vertical leg 14 and a horizontal leg 16. A bracket 12 is attached to vertical leg 14. Pivotaly attached to bracket 12, by means of a pivot pin 30 or the like, is a lever arm 28. A linking arm 40, at its forward end, is pivotaly attached to lever arm 28 by means of pivot pin 42 or the like and at its rear end is attached to a biasing or counterbalancing spring 54 which is anchored to a wall of the oven in which the hinge structure is mounted. The upper edge of bracket 12 and the lower edge of linking arm 40 form tracks between which a free-rolling, spool-like roller 56 is freely secured, by means of the force exerted on linking arm 40 by spring 54. As best seen in FIG. 4, roller 56 has a track 57 formed in its outer circumference, into which the edges of bracket 12 and linking arm 40 are seated. Lever arm 28 also has a V-shaped latch 32 pivotaly attached thereto by means of a pivot pin 34 or the like, for purposes to be explained.

Hinge structure 10 is mounted within the oven of a stove by means of a pair of mounting screws 18 which are fastened to the side wall of the oven and bracket 12. Biasing spring 54 can be anchored at a point in approximately the same horizontal plane as pivot pin 30, and does not have to be anchored at a much lower point, as in the past. Spring 54 may be anchored in this fashion because of the mode of operation of hinge structure 10, which is to be subsequently explained, and is important in that in many of the present day installations, particularly of wall-mounted type ovens, there is no convenient point at which the biasing spring may be anchored below the oven. Hence this installation problem is eliminated, by this invention.

Oven door 20, removably attached to hinge structure 10, as shown in FIG. 1, is a hollow structure formed of two pan-shaped panels, back panel 21 and front panel 23, which have edges that overlap to form an enclosed structure. Back panel 21 has a slot 22 which is perpendicular to its bottom edge and extends approximately one-fifth of the way up to its top edge. Mounted to back panel 21

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in the hollow structure of oven door 20 is a channel-forming member 24. Channel-forming member 24 is mounted immediately behind, and parallel to, slot 22 and extends from the bottom to the top of back panel 21. Oven door 20 is removably attached to hinge structure 10 by sliding lever arm 28 into the channel in oven door 20 formed by channel-forming member 24. Channel-forming member 24 also reinforces back panel 21 about slot 22. A shoulder 25 on lever arm 28 engages the top edge of slot 22 in back panel 21 to properly position oven door 20 with respect to hinge structure 10 and the front opening of the oven.

Only a single hinge structure 10 is shown but it is to be understood that duplicate hinge structures are used at each of the lower corners of door 20. However, since the construction of door 20 is the same at each of its lower corners and the hinge structures are identical, only hinge structure 10 and the one lower corner of door 20 are described.

The operation of hinge structure 10 may be explained as follows. Door 20 is normally held in the substantially vertical closed position, as shown in FIG. 3, by the force exerted by spring 54 upon linking arm 40 and pivotally attached lever arm 28. In this position, and in each of the positions subsequently described, the force exerted by spring 54 upon linking arm 40 and lever arm 28 is sufficient to counterbalance the weight of oven door 20, thereby preventing oven door 20 from freely falling to its substantially horizontal open position. Also, in this position, roller 56 is butted against the projecting surfaces 13 and 50 on bracket 12 and linking arm 40, respectively, restricting the movement of roller 56. The closed position of door 20 can therefore be said to be defined by these projecting surfaces 13 and 50.

The broil position for door 20 is defined by the pair of semi-circular grooves 15 and 48 in bracket 12 and linking arm 40, respectively. When oven door 20 is opened by swinging it outwardly and downwardly, lever arm 28 is pivoted about pivot pin 30 and, in so doing, forwardly displaces linking arm 40 with respect to bracket 12. Roller 56 is thereby caused to roll between the edges of linking arm 40 and bracket 12, until it seats in grooves 15 and 48, as shown in FIG. 5. The force exerted by spring 54 upon linking arm 40 yieldingly secures roller 56 in grooves 15 and 48, and oven door 20 is thereby yieldingly held in the partially open broil position.

As previously stated, door 20 is removably attached to hinge structure 10 since lever arm 28 is merely inserted and freely secured in the channel formed by channel-forming member 24. Removal is therefore accomplished merely by lifting door 20 free of lever arm 28. In accordance with the present invention, the difficulties heretofore encountered in replacing an oven door are eliminated by means of latch 32 pivotally attached to lever arm 28 by means of pivot pin 34. With door 20 mounted, the end 33 of latch 32 is butted against member 24 in door 20 and latch 32 is held in an inoperative position. However, when oven door 20 is removed while in the broil position, latch 32 pivots about pivot pin 35 and engages the vertical surface 19 on bracket 12. Hinge structure 10 is held in this position until door 20 is replaced to disengage latch 32. A pair of stop pins 36 and 38 are also provided to prevent latch 32 from rotating to an inoperative position, due to its being counterbalanced.

When door 20 is opened to its substantially horizontal open position, as shown in FIG. 6, linking arm 40 is again forwardly displaced with respect to bracket 12 by lever arm 28. This action causes roller 56 to roll between the edges of bracket 12 and linking arm 40, until it engages the projecting surfaces 17 and 46 on bracket 12 and linking arm 40, respectively. Spring 54 exerts sufficient force on linking arm 40 to securely butt projecting surfaces 17 and 46 against roller 56 to prevent door 20 from being further opened.

It may be noted that linking arm 40 has a protruding

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nose 44 on its forward end and that channel-forming member 24 has a slot 26 formed therein. These two members cooperate when door 20 is opened to any position beyond the broil stop position to prevent door 20 from being removed. When linking arm 40 is pivoted to the position shown in FIG. 6, protruding nose 44 protrudes through slot 26, hence preventing door 20 from being slid off of lever arm 28.

It may be noted that by using free-rolling roller 56, rather than a fixed roller, as in the prior art, the cost of the bracket and bearing assembly used to mount the fixed roller are eliminated. Furthermore, roller 56 being free-rolling, is virtually frictionless and troublefree, since there are no parts to bind or break, and, requires no lubricating.

The fact that biasing spring 54 may be anchored at a point in approximately the same horizontal plane as pivot pin 30, as previously mentioned, is due, partially, to the use of free-rolling roller 56. It may be noted that when oven door 20 is being opened, linking arm 40 is pulled by lever arm 28, and during the majority of its forward displacement, remains substantially parallel to the adjacent edge of bracket 12. The majority of the force exerted by spring 54 upon linking arm 40 must therefore be directed to oppose this forward displacement and very little force must be directed perpendicularly upon linking arm 40. On the other hand, with most of the arrangements known in the prior art, the majority of the force must be directed in a perpendicular direction, and hence the biasing spring must be anchored at a point considerably below the hinge structure assembly. The advantage of the present arrangement has been set forth above.

Bracket 12, lever arm 28, linking arm 40 and latch 32 are also fabricated of the same thickness material and may, therefore, be produced with a single stroke of a punch press or the like. The cost of manufacturing hinge structure 10 is therefore reduced considerably. Furthermore, by fabricating these components of the same thickness material and assembling them as shown in FIG. 3, bracket 12, linking arm 40 and latch 32 all lie in the same plane. Linking arm 40 and bracket 12 are therefore automatically aligned, one above the other, to form the track for roller 56 and latch 32 is properly aligned to engage vertical portion 19 of bracket 12.

While the invention is shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modification without departing from the true scope thereof, as set forth in the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A hinge structure for a door pivotally movable between two positions comprising: a bracket; a lever arm movable with said door and pivotally connected to said bracket; a linking arm connected at one end thereof to said lever arm; roller means; biasing means for biasing said linking arm against said roller means to engage said roller means between one edge of said linking arm and one edge of said bracket and for urging said linking arm in one direction to resist the movement of the door to said positions; said linking arm and said bracket each being constructed with a positioning groove in and a projecting surface on the edge thereof defining said positions, and said roller means being rolled between the edges of said linking arm and said bracket when said door is being moved between said two positions, engaged in said positioning grooves to yieldingly hold said door in one of said positions, or stopped against said projecting surfaces to hold said door in the other of said positions.

2. A hinge structure for a removable door pivotally movable between two positions comprising: a bracket; a lever arm movable with said door and pivotally connected to said bracket; a linking arm connected at one end thereof to said lever arm; roller means; biasing means for biasing said linking arm against said roller means to

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engage said roller means between one edge of said linking arm and one edge of said bracket and for urging said linking arm in one direction to resist the movement of said door to said positions; said linking arm and said bracket each being constructed with a positioning groove in and a projecting surface on the edge thereof defining said positions, said roller means being rolled between the edges of said linking arm and said bracket to allow movement of said door between said two positions, engaged in said positioning grooves to yieldingly hold said door in one of said positions, or stopped against said projecting surfaces to hold said door in the other one of said positions; and latch means attached to said lever arm, said latch means being normally held inoperative by said door and automatically operative when said door is removed to engage said bracket to retain said hinge structure in a predetermined one of said two positions.

3. A hinge structure for a removable door pivotally movable between two positions comprising: a bracket; a lever arm movable with said door and pivotally connected to said bracket; a linking arm connected at one end thereof to said lever arm; a roller having a groove therein about its circumference to form a track; a biasing spring for biasing said linking arm against said roller to engage said track in said roller between one edge of said linking arm and one edge of said bracket and for urging said linking arm in one direction to resist the movement of said door to one of said two positions; said linking arm and said bracket each being constructed with a positioning groove in and a projecting surface on the edge thereof defining said two positions, said roller being rolled between the edges of said linking arm and said bracket to allow movement of said door between said two positions, engaged in said positioning grooves to yieldingly hold said door in one of said two positions, or stopped against said projecting surfaces to hold said door in the other one of said positions; and latch means attached to said lever arm, said latch means being normally held inoperative by said door and automatically operative when said door is removed to engage said bracket to retain said hinge structure in a predetermined one of said two positions.

4. A hinge structure for a removable door pivotally movable between a first and a second position comprising: a bracket; a lever arm removably secured in a channel in said door and pivotally connected at one end thereof to said bracket; there being a slot in said channel; a linking arm connected at one end thereof to said lever arm; roller means; biasing means for biasing said linking arm against said roller means to engage said roller means between one edge of said linking arm and one edge of said bracket and for urging said linking arm in one direction to resist the movement of said door to said first and second positions; said linking arm and said bracket each being constructed with a positioning groove in and a projecting surface on the edges thereof defining said first and second portions, respectively; said roller means being rolled between the edges of said linking arm and said bracket to allow movement of said door between said first and said second positions, engaged in said positioning grooves to yieldingly hold said door in said first position, or stopped against said projecting surfaces to hold said door in said second position; and a projecting nose formed at one end of said linking arm, said projecting nose engaging said slot in said channel in said door and preventing the removal of said door when opened to a position beyond said first position.

5. A hinge structure for a removable door pivotally movable between a first and a second position comprising: a bracket, a lever arm removably secured in a channel in said door and pivotally connected at one end thereof to said bracket, a linking arm connected at one end thereof to said lever arm; there being a slot in said channel; a roller having a groove therein about its circumference so as to form a track; biasing means for biasing

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said linking arm against said roller to engage said track in said roller between one edge of said linking arm and one edge of said bracket and for urging said linking arm in one direction to resist the movement of said door to said first and second positions; said linking arm and said bracket each being constructed with a positioning groove in and a projecting surface on the edge thereof defining said first and second positions, respectively, said roller being rolled between the edges of said linking arm and said bracket to allow movement of said door between said first and said second positions, engaged in said positioning grooves to yieldingly hold said door in said first position, or stopped against said projecting surfaces to hold said door in said second position, said roller acting as a pivot for said linking arm when in engagement with said second positioning surfaces; latch means attached to said lever arm, said latch means being normally held inoperative by said door and automatically operative when said door is removed to engage said bracket to retain said hinge structure in said first position; and a projecting nose formed at one end of said linking arm, said projecting nose engaging said slot in said channel in said door and preventing the removal of said door when opened to a position beyond said first position.

6. A hinge structure for a removable door pivotally movable between a first and a second position comprising: a bracket, a lever arm removably secured in a channel in said door and pivotally connected at one end thereof to said lever arm; a roller having a groove therein about its circumference so as to form a track; a biasing spring for biasing said linking arm against said roller to engage said track in said roller between one edge of said linking arm and one edge of said bracket and for urging said linking arm in one direction to resist the movement of said door to said first and second positions; said linking arm and said bracket each being constructed with a positioning groove in and a projecting surface on the edge thereof defining said first and second positions, respectively, said roller being rolled between the edges of said linking arm and said bracket to allow movement of said door between said first and said second positions, engaged in said positioning grooves to yieldingly hold said door in said first position, or stopped against said projecting surfaces to hold said door in said second position; and a counter-balance latch means swingably attached to said lever arm, said latch means being normally held by said door in an inoperative position and swinging to an operative position to engage said bracket to retain said hinge structure in said first position when said door is removed.

7. A hinge structure for a removable door pivotally movable between a first and a second position comprising: a bracket, a lever arm removably secured in a channel in said door and pivotally connected at one end thereof to said bracket, a linking arm connected at one end thereof to said lever arm; there being a slot in said channel; a roller having a groove therein about its circumference to form a track; a biasing spring for biasing said linking arm against said roller to engage said track in said roller between one edge of said linking arm and one edge of said bracket and for urging said linking arm in one direction to resist the movement of said door to said first and second positions; said linking arm and said bracket each being constructed with a positioning groove in and a projecting surface on the edge thereof defining said first and second positions, respectively, said roller being rolled between the edges of said linking arm and said bracket to allow movement of said door between said first and said second positions, engaged in said positioning grooves to yieldingly hold said door in said first position, or stopped against said projecting surfaces to hold said door in said second position; a counter-balanced latch means swingably attached to said lever arm, said latch means being normally held by said

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door in an inoperative position and swinging to an operative position to engage said bracket to retain said hinge structure in said first position when said door is removed; and a projecting nose formed at one end of said linking arm, said projecting nose engaging said slot in said channel in said door and preventing the removal of said door when opened to a position beyond said first position.

8. A hinge structure for a door pivotally movable between a first and a second position comprising: a bracket; a lever arm movable with said door and pivotally connected to said bracket; a linking arm connected at one end thereof to said lever arm; roller means interposed between said linking arm and said bracket; biasing means for biasing said linking arm against said roller means to engage said roller means between one edge of said linking arm and one edge of said bracket and for urging said linking arm in one direction to resist movement of said door to said second position, said linking arm and said bracket each being constructed with first and second positioning surfaces on said edges thereof defining said first and said second positions, said roller means being rolled between said one edge of said linking arm and said one edge of said bracket when said door is being moved between said first and second positions, in engagement with said first positioning surfaces to yieldingly hold said door in said first position or in engagement with said second positioning surfaces to yieldingly hold said door in said second position, said roller acting as a pivot for said linking arm when in engagement with said second positioning surfaces.

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9. A hinge structure for a door pivotally movable between a first and a second position comprising: a bracket; a lever arm movable with said door and pivotally connected to said bracket; a linking arm connected at one end thereof to said lever arm; a roller interposed between said linking arm and said bracket, said roller having a groove therein about its circumference to form a track; biasing means biasing said linking arm against said roller to engage said track between one edge of said linking arm and one edge of said bracket and for urging said linking arm in one direction to resist the movement of said door to said second position, said linking arm and said bracket each being constructed with first and second positioning surfaces on the edges thereof defining said first and second positions, said roller means being rolled between said one edge of said linking arm and said one edge of said bracket when said door is being moved between said first and second positions, in engagement with said first positioning surfaces to yieldingly hold said door in said first position or in engagement with said second positioning surfaces to yieldingly hold said door in said second position.

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