Feb. 18, 1958 E. E. AYLOR 2,823,662

OVEN DOOR HINGE CONSTRUCTION

Filed Jan. 24, 1955 2 Sheets-Sheet 1

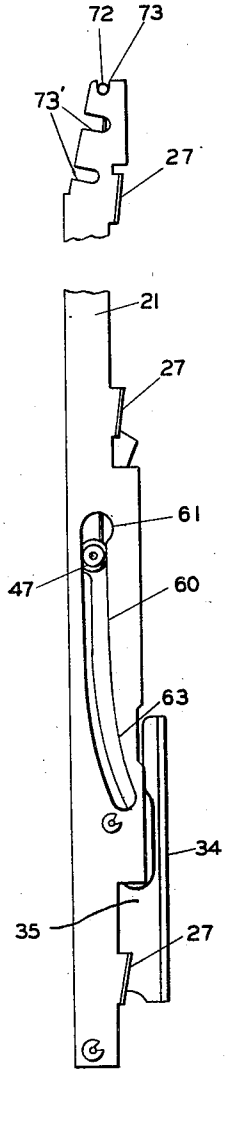


FIG. 3

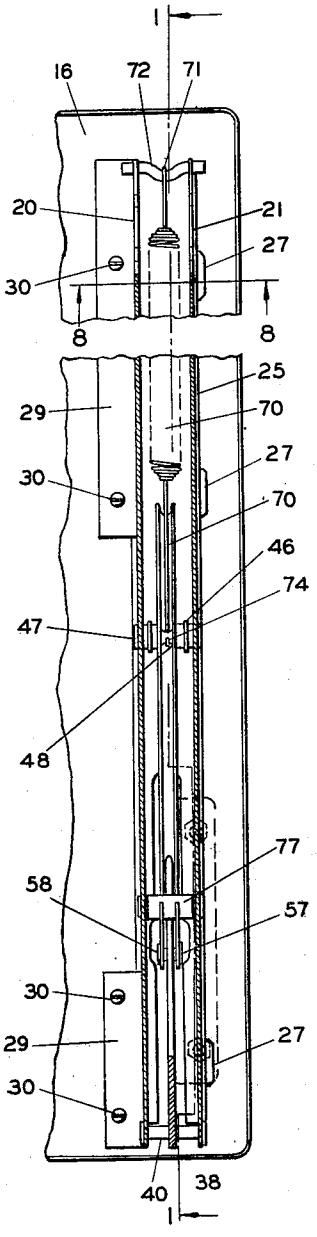


FIG. 2

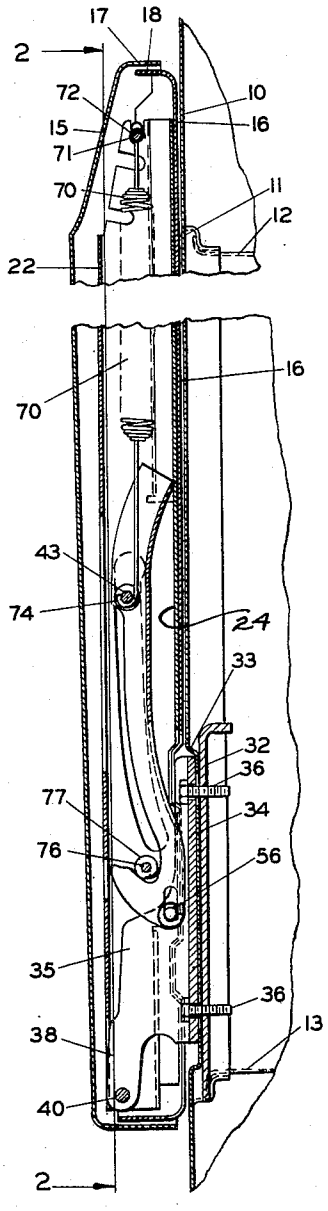


FIG. 1

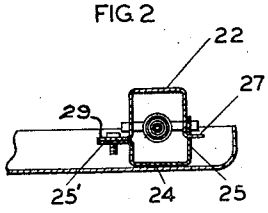


FIG. 8

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Feb. 18, 1958 E. E. AYLOR 2,823,662

OVEN DOOR HINGE CONSTRUCTION

Filed Jan. 24, 1955 2 Sheets-Sheet 2

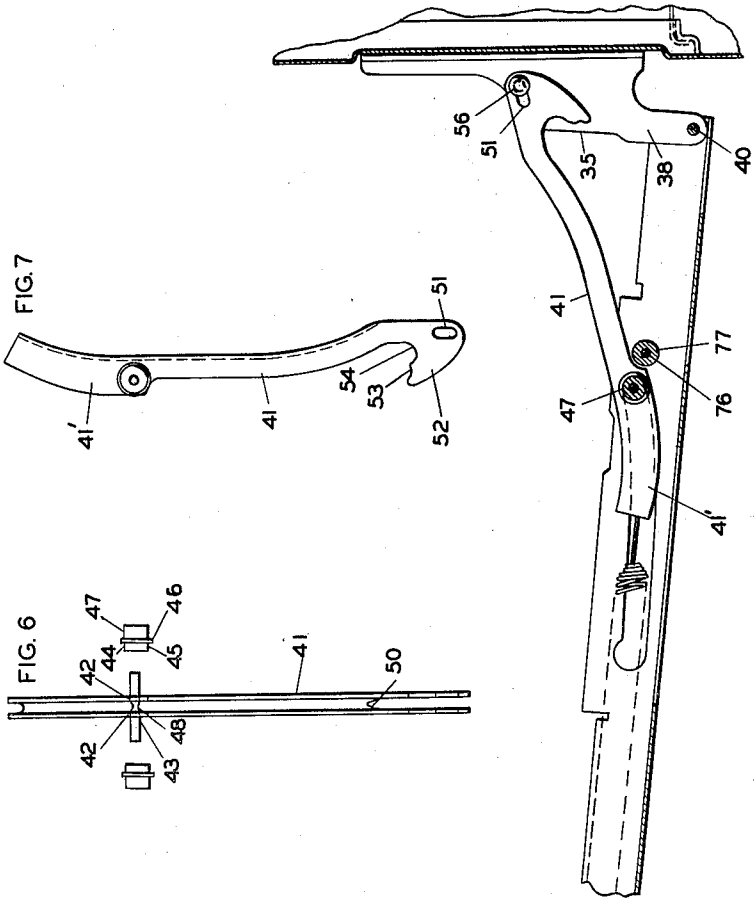


FIG. 4

FIG. 7

FIG. 6

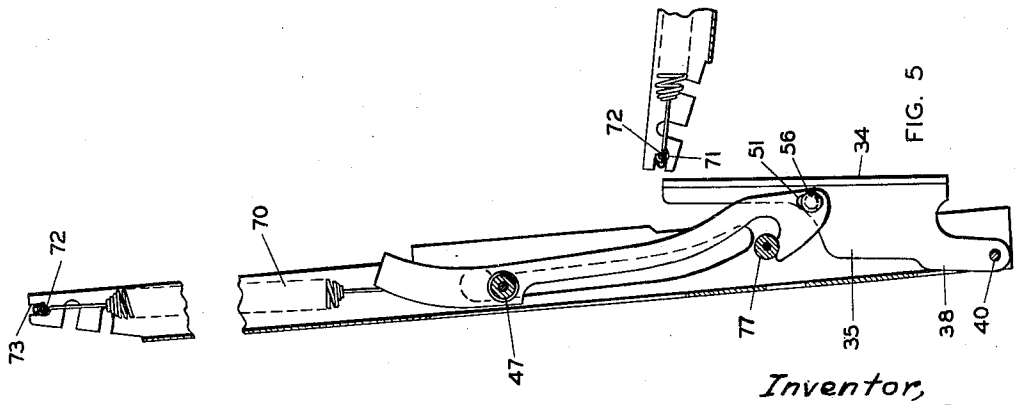


FIG. 5

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OVEN DOOR HINGE CONSTRUCTION

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8 Claims. (Cl. 126—191)

This invention relates to cooking ranges and the like and more particularly to an improved hinge construction useful in connection with range ovens.

In connection with ranges it is customary to provide a door for closing the front opening to the oven; which doors are commonly hinged to the frame at the bottom of the opening and are usually movable from a closed position where the door is vertical to an open position where the door is horizontal. It is desirable to provide counterbalancing means for the door which prevents the door from falling open, holds the door in a closed position to seal the oven against the egress of heat, and particularly in electric ranges to hold the door in a partially open position, commonly known as the "broil" position. In the last mentioned position a broiler element in the top of the oven operates to the exclusion of the main oven heating element to permit broiling of food.

Heretofore substantially all of the hinge means for such oven doors included a relatively complicated system of levers, rollers and springs which were disposed alongside the oven liner between the liner and the outer casing. Although these devices were satisfactory in operation they were difficult to repair because they were hard to get at, requiring the removal of the outer casing or the oven liner. They also were difficult to assemble in production. Another disadvantage resides in the fact that the space necessary to the operation of these prior devices reduced the amount of insulation that could be used in this area resulting in a heat loss from the oven through the side of the range, as well as complicating the installation of the insulation so that it would not interfere with the operation of the hinge.

By my present invention I have provided a hinge construction which counterbalances the weight of the door allowing the door to be moved through its full range of movement without any substantial effort on the part of the user. The operating portion of the mechanism is enclosed substantially entirely within the door itself, except for the hinge support bracket which is secured to the frame at the side of the door. It is readily accessible for the replacement of parts by removing the outer panel from the door, which is a relatively easy thing to do as compared with taking off the side of a range. The door is held securely in a closed position and may also be moved to a "broil" position where the door is partly open. Furthermore, in the open position a greater support is provided for the door preventing springing of the same if heavy objects are placed thereon.

Still other advantages of the invention and the invention itself will become more apparent from the following description of an embodiment thereof, which description is illustrated by the accompanying drawings and forms a part of this specification.

In the drawings:

Fig. 1, is a fragmentary sectional view of the front of a range and the door secured thereon taken on the

line 1—1 of Fig. 2, but with the outer panel 15 of the door included;

Fig. 2, is a similar section taken from a plane indicated by the line 2—2 of Fig. 1, but with the outer panel 15 of the door omitted;

Fig. 3, is a broken view of the spring and hinge assembly removed from the door the parts being in the position assumed when the door is closed;

Fig. 4, is a view similar to that of Fig. 1 with the door in the full open position with the inner and outer panels removed but with the link shown in elevation;

Fig. 5, is a similar view of the mechanism detached from the door, and showing the position the parts assume when the door is in the "broil" position;

Fig. 6, is a front and elevational and exploded view;

Fig. 7, is a side view thereof; and

Fig. 8, is a section on the line 8—8 of Fig. 2.

Briefly, my invention comprises a hinge bracket 34, 35 secured to the frame of the range housing or cabinet, with the oven door 15, 16 pivotally connected to the hinge bracket and a link 41 connected to the hinge bracket and engaged in a cam slot 60 on the door, and with an actuating spring 70 connected between the door and the link. All of the parts except the hinge bracket are disposed between the front and rear panels 15 and 16, respectively, of the door. The spring operates in conjunction with the link and the cam slot to control the opening and closing of the door.

More specifically, as shown in Fig. 1, the front of the range 10 is provided with a door opening at 11 opposite to a liner which includes top and bottom walls 12 and 13. It will be appreciated that the preferred form of the invention contemplates two of the assemblies about to be described, one of each assembly being provided in opposite edges of the door.

The door includes an outer front panel 15 and an inner rear panel 16 constructed in the usual manner being provided with edge flanges 17 and 18 respectively, the inner panel flanges 18 being nested in the outer panel flanges 17 and held together in any manner well known in the art. The hinge assembly of my invention is secured to the inner panel 16 of the door. The hinge assembly which is illustrated in Fig. 3, removed from the oven door, comprises a U-shaped channel member 20—22 having spaced side walls 20 and 21 held in spaced relation and connected to each other by a bridging wall 22. It will be appreciated that these channels can take various forms and that if desired the spaced walls could be provided by spaced members integral with the inner door panel 16 or, for that matter, the outer door panel 15. In this particular instance, as a matter of convenience, for supporting the channel member 20—22 of the hinge assembly the inner door panel 16 is provided with a channel member 24, welded to the inner panel of the door, Fig. 8, one side of which provides a flange 25 normal to the panel 16 and the other side of which provides offset arms 25'. As a matter of convenience, the hinge assembly of Fig. 3 is provided with ears 27 on the one side which are received in apertures in the flange 25. The channel 20—22 of the hinge assembly is provided with flanges 29 at the top and bottom which enables the assembly to be secured in place by screws 30 to the arms 25' on the support channel 24. It will thus be seen that the hinge assembly can be installed and removed easily, being held by the ears 27 which extend into slots in the flange 25 on one side of the support channel 24 and by the screws 30 attached to the support channel 24 on the other side. This is a desirable form of construction since it lends itself to easy assembly on the assembly line and to complete adjustment of the door as to position relative to the opening at the front of the oven compartment of

the range prior to placing the outer door panel 15 in position.

The hinge bracket 34, 35 is preferably secured to the range prior to the installation of the side panels of the range, this being the only part that is partially inaccessible due to the fact that a threaded strip 32 is disposed to the rear of the oven flange 33. The hinge bracket includes a base 34 outwardly of which and at right angles thereto a portion 35 extends, this part extending through an opening in the oven liner at the front. The oven liner is offset in this portion to provide a seat for the base 34 which is held to the liner by screws 36 which extend through the base 34 of the hinge bracket and the liner into the threaded strip 32. As is the usual practice, the liner, where the screws pass through the same, is provided with elongated slots which enable a vertical adjustment of the hinge bracket relative to the opening in the oven.

The hinge bracket 34, 35 is provided with a downwardly and outwardly extending horn 38 having an opening for the reception of a hinge pin 40. The hinge pin 40 also extends through the sides 20 and 21 of the channel member secured to the inner panel 16 of the door, thereby hinging the door to the hinge bracket 34, 35.

A control link 41 is provided, one end of which is pivotally and slidably connected to the hinge bracket 34, 35 and the other portion of which is connected by a roller 44 to the side walls 20 and 21 of the channel member 20—22 on the door. This link, best shown in Figs. 6 and 7, comprises an irregularly formed channel shaped body 41, the body generally being U-shaped in cross-section and the flanges being enlarged at the upper portion as shown at 41' in Fig. 7. Adjacent the lower portion of the enlarged part 41' there is provided a pair of openings 42 (Fig. 6) which receive therein a cross pin 43, the ends of which extend beyond the sides of the link and have rotatably journalled thereon rollers 44, each of which include a base 45, an intermediate flange 46 and an end portion 47. As will be seen later, these rollers are engaged in cam slots 60 in the side walls 20 and 21 of the channel member 20—22 on the door. The center of the cross pin 43 is provided with a groove 48 for the reception of the hook on the end of a spring 70, later to be described.

The bottom of the link 41 is bifurcated at 50 to provide spaced parallel portions having aligned elongated slots 51 near the extremity. The bottom of the link also curves outwardly to provide an extension 52, which presents a shallow notch or seat 53 on its outer end facing away from slot 51. A second deeper notch 54 is formed between the extension 52 and the remainder of link 41.

The link 41 is secured to the hinge bracket 34, 35 by a pin 56 which extends through the slot 51, the pin having a head 57 and held in place by a C-washer 58 disposed in a groove in the pin on the opposite side of the link. It will thus be seen that the link 41 is pivotally connected to the hinge bracket 34, 35 and is capable of a longitudinal movement on its pivot 56.

The side walls 20 and 21 of the channel member 20—22 on the door are each provided with aligned pairs of cam slots 60. These slots are provided with an enlarged portion 61 at the top, as shown in Fig. 3, which enables the link roller 44 to be assembled on the link 41. Once assembled, the flanges 46 on these rollers are located between the respective sides 20, 21 of the channel member 20—22 on the door while the roller rolls in the main portion of the cam slot 60. Preferably each cam slot 60 at its upper end starts close to the outer edge of the respective side wall 20 or 21 of the channel member, near the bridging wall 22 of that channel member, and extends substantially straight downward for about two-thirds the length of the channel member 20—22 and then curves inwardly at 63 toward the inwardly disposed edge of the side wall 20 or 21 of the channel member 20—22.

A spring 70 is provided, one end of which is provided with a hook 71 hooked over a retainer anchor pin 72 disposed in aligned notches 73 on the upper end of the channel member 20—22 on the door. The other end of the spring is provided with a hook portion 74 which hooks over the cross pin 43 on the link 41, being disposed in the groove 48 thereof. This spring is secured in place so that it is under tension when the door is closed. The degree of tension can be varied without changing the spring since the side walls 20 and 21 of the channel member 20—22 on the door may be provided with auxiliary notches 73', which are clearly shown in Fig. 3. As will be appreciated, when the anchor pin 72 is placed on the notch 73 the greatest tension on the spring is realized. If the anchor pin is moved to the notch 73' less tension is applied to the same spring. Thus it may be necessary to stock only one spring in which the whole assembly will suffice for many doors of different sizes and weights. Obviously changing the wire gauge of the spring will increase the range of doors with which the device may be used.

A pin 76 is provided, extending between the side walls 20 and 21 of the channel member 20—22 on the door below the cam slot 60—63, and carries a roller 77 between these walls 20 and 21. This roller is adapted to engage with the notches 53 and 54 at the pivoted end of the link.

The operation of the device is as follows:

The door hinges around the hinge pin 40 in a normal manner. In the position shown in Fig. 1, the spring 70 is pulling upward on the link rollers 44 and thus urging the link 41 upward along the cam slot 60. The forces are such, in this position, that the door is held securely closed. It will be noted that a line drawn from the pin 72 through the center of the roller 44 is to the left, as viewed in Fig. 1, of a line drawn through the pin 72 and the pin 56. Therefore, pressure is exerted in a direction forcing the roller 47 against the side of the cam slot 60 on the door, moving the door toward the closed position.

In the closed position the roller 77 is spaced slightly above the bottom of the deep notch 54 in the link 41 and is engaged by the extension 52 on the link. Since the spring 70 and link 41 are now positioned so that the resultant pressure on roller 44 is inward toward the oven a moment of force is exerted on the pin 76; this moment of force is applied at the link extension 52, which being short as compared to the distance between roller 44 and the pivot 56 for link 41, exerts a multiplied force against pin 76 that forces the door inward. In addition, the pivot pin 40 for the door, being outside of the center of gravity of the door, the weight of the door also holds the door inward.

As can be seen from Fig. 5, the oven door may be moved to a partially open position and will remain in that position. This is brought about by the fact that when the door is open the pivoted end of the link 41 being held by the pivot 56 to the bracket, the roller 77 rolls upward out of the deep notch 54 forcing the link 41 downward, increasing the tension on the spring 70 and eventually seating in the shallow notch or seat 53 on the extension 52 of the link 41. In this position the forces are such that the door, due to the roller 77 seated on the seat 53, holds the door in the partially open position and the increased tension of the spring 70 assists in this holding action. This overcomes any tendency of the roller 44 in the cam slot 60 to close the door and in this position the pivot pin 56 for link 41 is substantially centered in the slot 51. In this position like forces are all in a substantially straight line or dead center. It should be noted that the forces exerted on the pin 56 at this time when the door is in either the closed or "broil" position are laterally against the edges of the slot 51.

When the door is opened to the open position, shown in Fig. 4, the link 41 is held by the pin 56 which is now in the end of the slot 51 and the roller 44 moves downwardly in the curved cam slots 60 until it bottoms in the lower end of the cam slots. At this time the door is sus-

pended by the hinge pin 40 and by the link 41 which thus connects to the door at a point spaced a considerable distance from the hinge pin, and, therefore, provides a very substantial support for the door in the open position, preventing distortion of the door if undue pressure is placed upon it. At this time the spring 70 is also materially stretched and is, therefore, exerting the greatest pressure because of a line drawn from the anchor pin 72 through the roller 77 and the link pin 56 now represents a greater angularity with the result that the force on the roller 47 against the sides of the cam slot is exerting a pressure in the upward direction or in a direction represented by a line bisecting the angle, which pressure is greater than when the door is in the closed position, by the fact that the angle is more acute and by the fact that the spring is under greater tension. The amount of this pressure, as stated, is determined by the notch in which the anchor pin 72 is placed. Therefore, although the door remains in an open position the tension on the spring may be so adjusted that substantially no effort is required to move the door from the position shown, which is slightly above the horizontal, toward the closed position. The curvature of the cam slot is such that when the door is moved toward the closed position, the change of angle at which the forces are applied to the roller 47 plus the fact that the spring decreases in tension enables the door to be left in substantially any position, between opened and closed, without its closing of its own accord. On the other hand, by simply moving the position of the anchor pin the door can be made to partially close to the "broil" position without slamming. Or the door can be made to close fully by merely starting it to close with more inertia.

It will thus be seen that I have provided a hinge structure which, with the exception of the base of the bracket, may be completely serviced without disassembling anything other than the door. This structure is also such that it may be placed near the edge of the door which is normally the coolest portion of the range, and, the parts are not affected by heat. The insulation that is displaced is at a point where substantially no insulation is needed.

It is also apparent that one hinge assembly can be made for a full line of ranges, which is particularly desirable, since it is standard practice among manufacturers to provide ranges having various sizes of ovens. Furthermore, there does not have to be any difference between the right and left hand hinges, although in practice it may be desirable to provide the channel assembly as right and left hand pairs so as to facilitate assembly since they are close to the edge of the door.

Having thus described my invention I am aware that numerous and extensive departures may be made therefrom without departing from the spirit or scope of the invention as defined in the appended claims.

I claim:

1. In combination, a cabinet having an opening therein, a door pivotally mounted on said cabinet for movement toward and away from a position in which it closes said opening, a link having a connection to the cabinet, spaced from the pivotal mounting of the door on the cabinet and swingable about said connection, said door having guide means spaced from its pivotal mounting which extends along the door away from said pivotal mounting, a follower carried by said link slidably engaging said guide means for movement along said guide means upon pivotal movement of the door, and spring means acting between the door and said follower which maintains the follower bearing against said guide means throughout the pivotal movement of the door to exert a force at said follower against the door urging the door to its closed position.

2. In combination, a cabinet having an opening therein, a door pivotally mounted at its lower end on said cabinet for movement toward and away from an upright position in which it closes said opening, a rigid link having a connection to said cabinet above the pivotal

mounting for the door and toward the interior of the cabinet from the pivotal mounting of the door, said link being swingable about said connection, said door having guide means which terminates at its inner end in spaced relation to the pivotal mounting of the door and which extends along the door outward from said pivotal mounting, a follower carried by said link in spaced relation to said connection of the link to the cabinet and slidably engaging under said guide means for movement along said guide means inward toward said pivotal mounting of the door upon pivotal movement of the door about its pivotal mounting down away from said upright position, and a spring acting between the door and said follower which urges the follower outward along said guide means away from said pivotal mounting of the door and maintains said follower bearing against said guide means to apply an upward force against the door at said follower which urges the door toward its upright position.

3. The combination of claim 2, wherein said guide means comprises means carried by the door which presents an elongated cam slot extending along the door outward from its pivotal mounting, said follower comprises a roller slidably received in said cam slot, and said spring means is a tension spring coupled to the door at a location thereon spaced outward from the extreme limit of movement of the roller outward along the cam slot.

4. The combination of claim 2, wherein said connection between the link and the cabinet comprises means defining an oblong slot and a pivot pin slidable in said slot, said guide means comprises a member carried by the door which defines an elongated cam slot extending along the door outward from its pivotal mounting, said follower is received slidably in said cam slot, and said spring means is a tension spring coupled to the door at a location thereon spaced outward from the extreme limit of movement of the follower outward along the cam slot.

5. The combination of claim 4, wherein said cam slot curves inward toward the interior of the cabinet in a direction downward along the door when the door is in its upright position.

6. The combination of claim 4, wherein said link has an extension which projects toward the door and away from said pin and slot connection of the link to the cabinet and which terminates in a notch facing away from said pin and slot connection, and said door carries a member positioned toward the pivotal mounting of the door inward from the inner end of the cam slot which seats in said notch when the door is displaced downward slightly from its upright position closing said opening in the cabinet.

7. The combination of claim 4, wherein said link adjacent its pin and slot connection to the cabinet has an extension which projects toward the door and which is spaced from the remainder of the link by a deep notch, and said door carries a member positioned toward the pivotal mounting of the door inward from the inner end of said cam slot, said member when the door is in its upright position being received in said notch with said extension bearing inward against said member to maintain the door in said upright position.

8. The combination of claim 4, wherein said link adjacent its pin and slot connection to the cabinet has a short extension which projects toward the door and which is spaced from the remainder of the link by a deep notch, said extension terminating in a shallow notch which faces away from said pin and slot connection, and said door carries a roller positioned toward the pivotal mounting of the door inward from the inner end of the cam slot, said roller when the door is in said upright position being received in said deep notch with said extension bearing inward against the roller to maintain the door in said upright position, and said roller seating in said shal-

low notch when the door is displaced slightly down away from said upright position.

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