United States Patent [19]

Kleinhenn

[11] **3,749,080**

[45] **July 31, 1973**

[54] **OVEN DOOR HINGE**

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[73] Assignee: **United Filtration Corporation,** Chicago, Ill.

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[52] **U.S. Cl.** **126/191,** 126/194, 16/146

[51] **Int. Cl.** **F23m 7/00**

[58] **Field of Search** 126/191, 194; 16/145, 146

[56] **References Cited**

UNITED STATES PATENTS

3,503,380 3/1970 Vasaturo 126/191

3,067,736 12/1962 Barefoot 126/194

Primary Examiner—Carroll B. Dority, Jr.

Attorney—Frederick J. Olsson

[57] **ABSTRACT**

A structure especially useful as a hinge to support an oven door comprising a spring which is self contained within a casing and a counter balancing system operatively connected between the door and the spring together with latch mechanism operative during assembly of the hinge to the oven to lock the hinge in a partially open position so that the same cannot close and injure the assembler and damage the oven.

6 Claims, 13 Drawing Figures

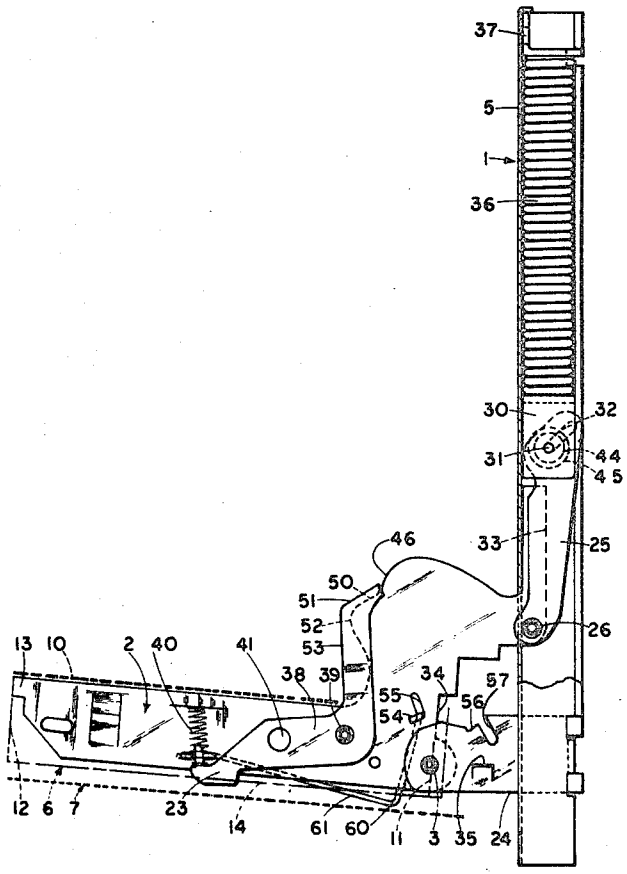


FIG. 1

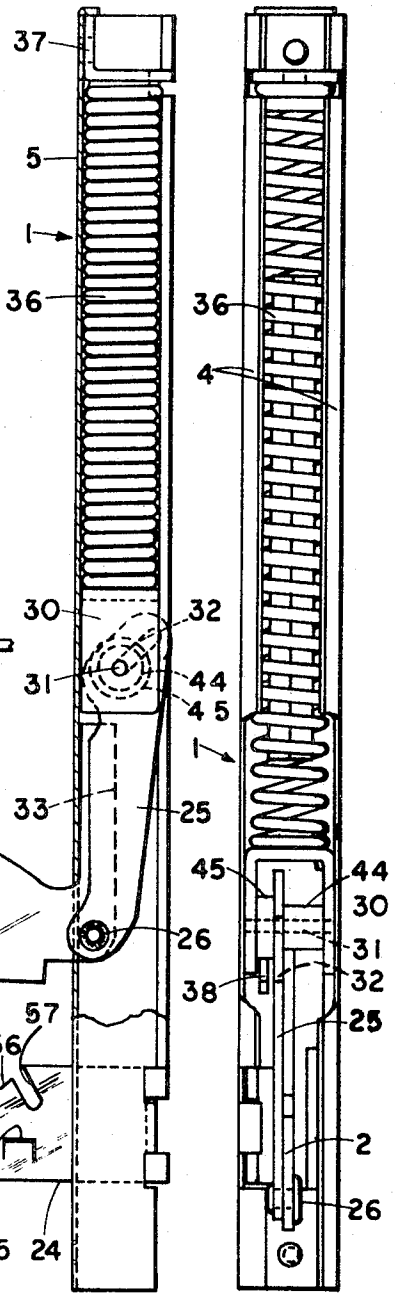


FIG. 4

FIG. 6

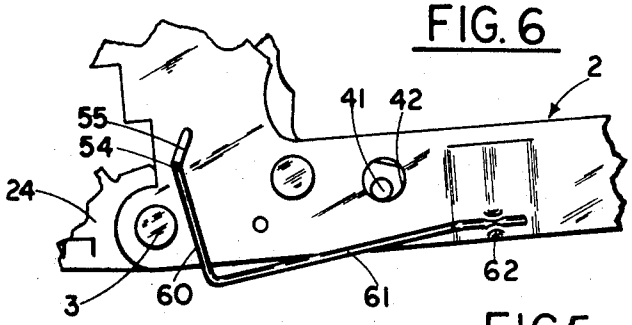


FIG. 5

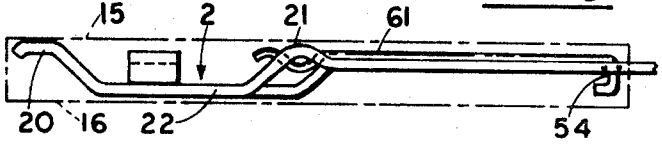


FIG. 2

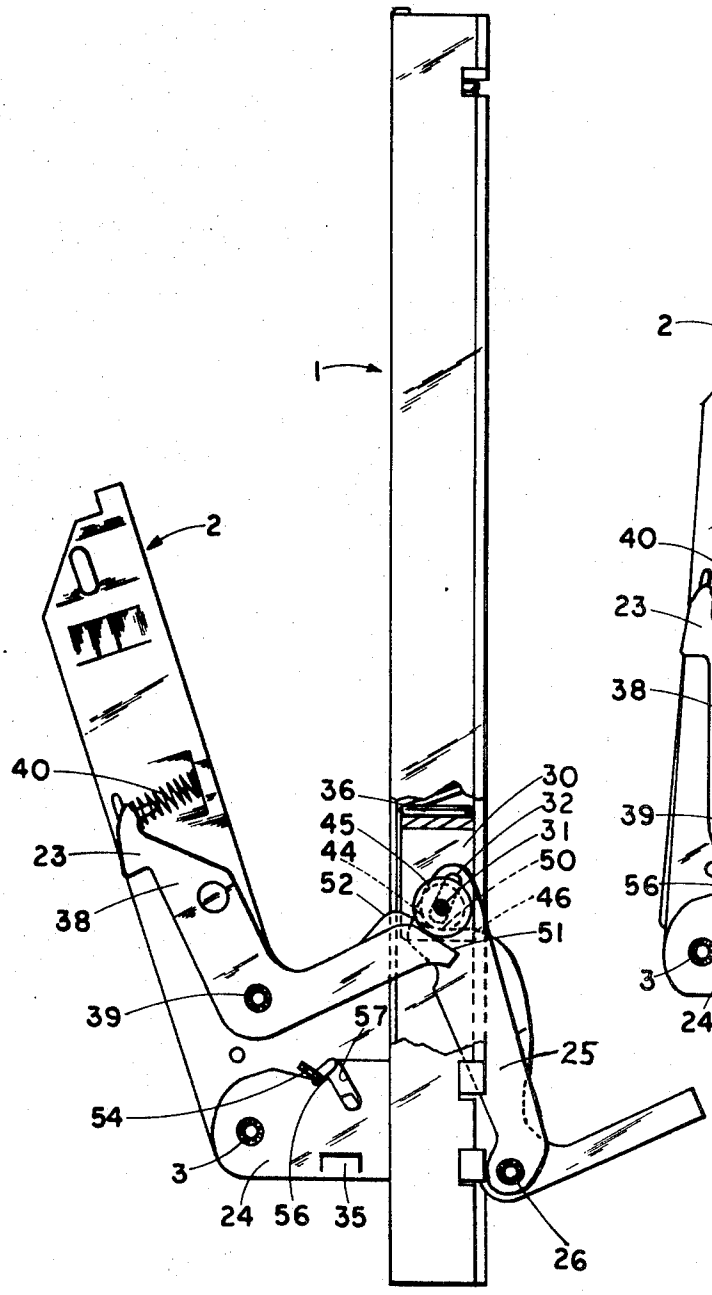

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FIG. 3

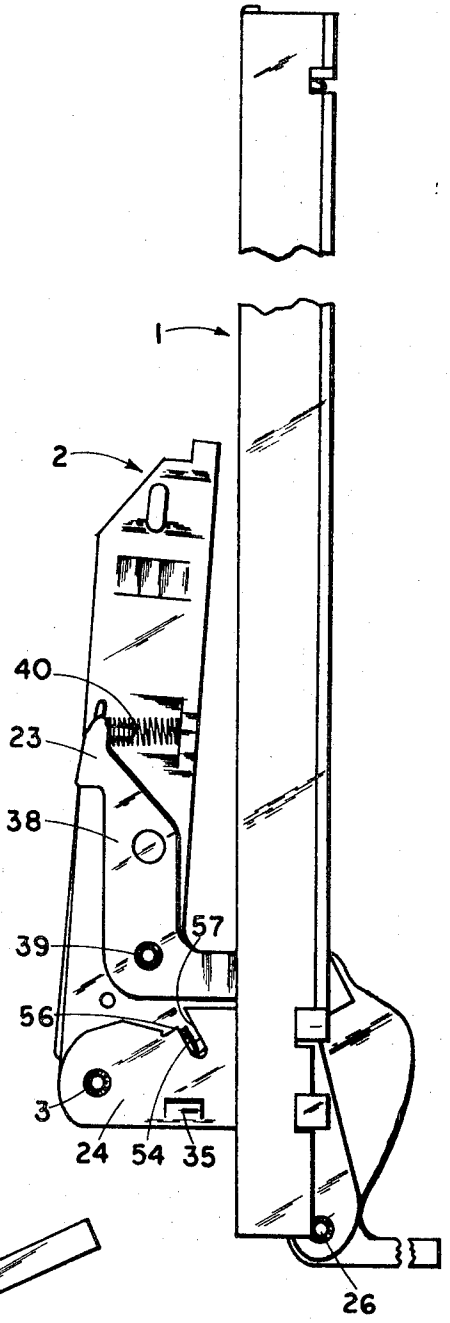

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FIG. 8

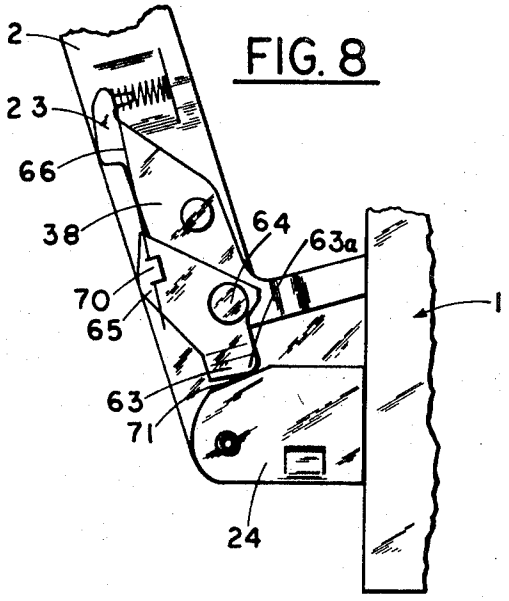


FIG. 9

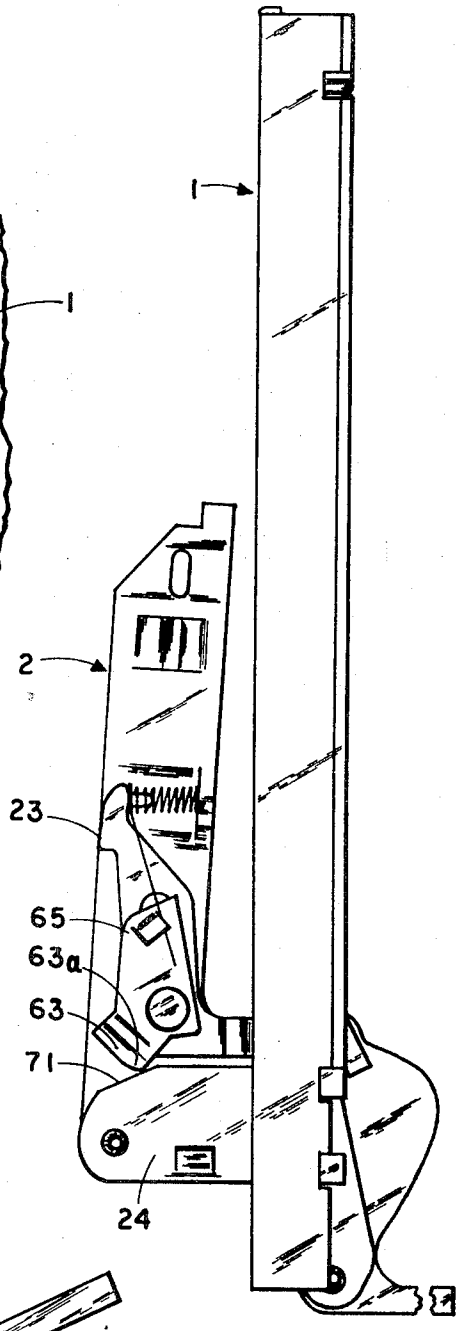


FIG. 7

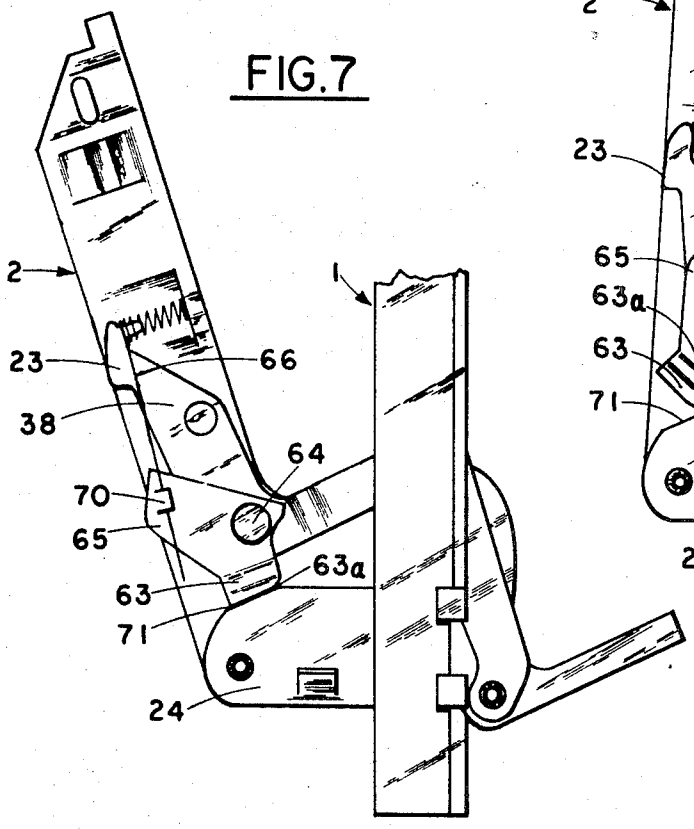


FIG.12

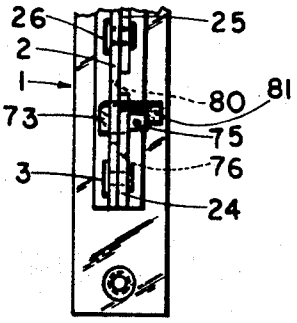


FIG.13

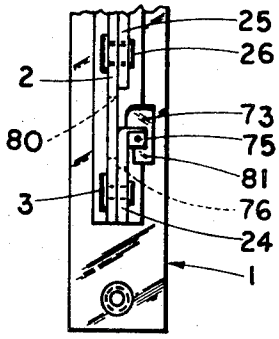


FIG.11

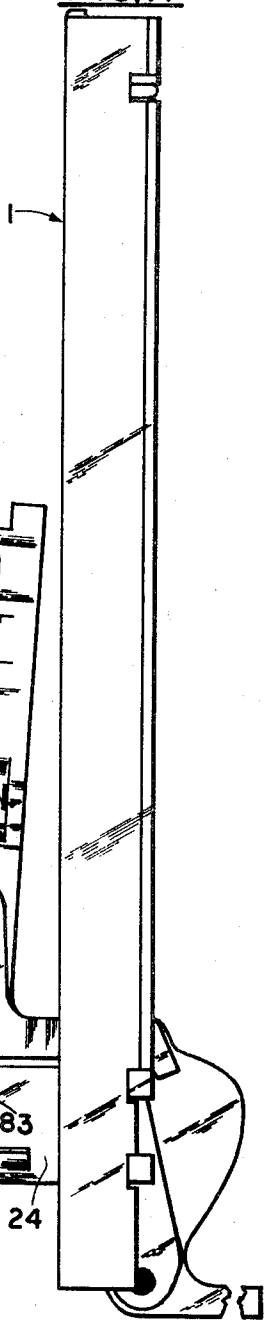
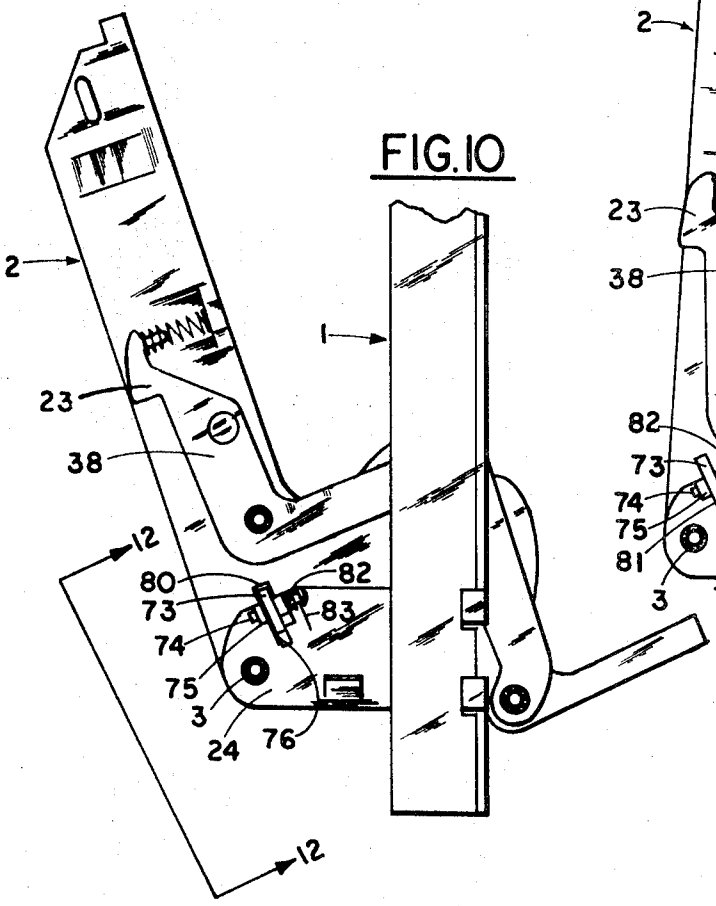


FIG.10



OVEN DOOR HINGE

This invention relates to hinges especially suitable for supporting drop type oven doors for free standing or built in ovens.

The conventional cook oven has a hollow body with an access door hinged to the bottom. The door is rotatable in a vertical direction, as between a closed position wherein the door extends vertically and an open position where the door extends generally horizontally, In the closed position the door seals off the oven and in its horizontal position the door provides for access to the interior of the oven. A door of the kind described is commonly referred to as a drop type door. For broiling purposes such ovens provide for the door to be held slightly spaced from the closed position and this is commonly called the broil position.

In the broil position the door may be taken off the hinges, cleaned and then replaced.

The hinges of the invention are especially adapted for supporting the door of ovens of the type described above. While in the material below reference is made to a single hinge, this is done for ease of description and it will be understood that two identical hinges are used one on each side of the door.

The hinges of the invention are a substantial improvement in self-contained, spring loaded oven hinges of the kind shown in U.S. Pat. No. 3,503,380 and in copending application Ser. No. 74,815 filed Sept. 23, 1970 and now abandoned.

The assembly of such hinges to the oven requires the hinge to be placed in a partially open or broil position. The assembler must be careful not to strike the hinge because the same may dislodge from the detent holding the hinge in broil. Upon such dislodgement the spring will quickly and forcefully move the hinge to the closed position. This exposes the operator's fingers to cutting or even fracture. When the oven is equipped with a stainless steel or porcelain rim, the same can be irreparably damaged. Thus the assembler must exercise caution and perform the assembly operation very slowly and this slows down production.

The dangers expressed above are also present when the housewife removes the oven door, for example, the hinge could be dislodged by the door striking the hinge just as the door is lifted off or when the door is just about to be replaced. In either case, damage to the oven is inevitable. Injury to the fingers is also a distinct possibility.

Thus the principal object of the invention is to provide a hinge and latch mechanism which will automatically lock the hinge in partially open position during assembly and when the door is removed for cleaning but which will be automatically deactivated when the door is mounted on the hinge.

The preferred forms of the invention will be described below in connection with the following drawings wherein:

FIG. 1 is a side elevational view of a hinge embodying the invention, the hinge being in the door-open position;

FIG. 2 is a side elevational view of the hinge of FIG. 1 in the partially open or broil position;

FIG. 3 is a side elevational view of the hinge of FIG. 1 in the door closed position;

FIG. 4 is an elevational view looking toward the left in FIG. 3;

FIG. 5 is a fragmentary plan view showing latch components of the hinge of FIG. 1;

FIG. 6 is a fragmentary elevational view of certain of latch components of the hinge of FIG. 1, the view being taken from the back side of FIG. 1;

FIG. 7 is an elevational view of a hinge having a modified embodiment of the invention the hinge being in the partially open or broil position;

FIG. 8 is a fragmentary view of certain latch components of the hinge of FIG. 7;

FIG. 9 is an elevational view of the hinge of FIG. 7 in the closed position;

FIG. 10 is an elevational view of a hinge embodying a modified form of the invention, the hinge being in the partially open or broil position;

FIG. 11 is a view of the hinge of FIG. 10 in closed position;

FIG. 12 is a view taken along the lines 12—12 of FIG. 10 and illustrating latch components; and

FIG. 13 is a view similar to FIG. 12 but with the latch mechanism in inoperative position.

With respect to the description of FIGS. 1 thru 13 which follows, it will be understood that the door has been removed from the hinge.

As shown in FIG. 1 the hinge structure includes the elongated housing or casing 1 which is constructed to be fixed in a vertical position on the frame of the oven. The hinge has a carrier arm 2 which is pivotally connected to the casing as by the pivot mechanism 3. The arm mounts the oven door and provides for the same to be rotatable as between the open, broil and closed positions. The arm is interconnected with the casing by operating mechanims providing for the various rotational positions.

In FIG. 1 the hinge is in the open position, with the carrier arm 2 extending generally horizontally. In this position the door is locked on the arm and cannot be removed.

In FIG. 2 the carrier arm is in partially open or broil position. In the broil position, the door can be lifted off the arm and then replaced.

In FIG. 3 the carrier arm is in the closed position. It will be noted that the arm is somewhat angularly oriented with respect to the vertically extending casing. Actually, when the door is on the arm the same extends more vertically than as shown in FIG. 3. This is to permit the spring-detenting arrangement (which will be explained later) to hold the door in tight engagement with the oven.

The casing 1 is U-shaped in cross section and the back of the casing has a pair of inwardly extending flanges 4. The front or bottom of the casing is indicated at 5.

Preferably the oven door is equipped with a socket. The door is mounted on the carrier arm as by sliding the socket straight down over tha arm. The door is automatically locked in position except for removal purposes as mentioned above. In FIG. 1 the socket is generally indicated by dot-dash lines 6 and the door is indicated by the heavy dotted lines 7. The socket is U-shaped in cross section with the mouth of the U being fixed to the inside plate 10 of the door. The socket is open ended at 11 and closed at 12 so that the end 13 of the arm abuts against the end of the socket. The bottom 14 of the socket fits along the lower edge of the carrier arm and sides 15 and 16 (see FIG. 5) abut the off-set 20, 21, and 22 of the carrier arm. The bottom

14 is provided with a small opening (not shown) which receives the latch 23 which functions to lock the door on the arm.

A pivot bracket 24 is mounted directly on the bottom of the casing 1 and has the pivot means 3 which rotatably connects the carrier, bracket and the casing with the carrier arm.

With respect to the structure of the door 7, it will be understood that an opening is provided which is aligned with the socket 6 and which accomodates the pivot bracket 24 and carrier arm 2. For a typical door-socket-oven arrangement of the kind described above reference may be had to U.S. Pat. No. 3,505,380.

A lever arm in indicated at 25. The lever arm is connected to the carrier arm as by the pivot 26. The pivot 26 provides for the lever arm and the carrier arm to be relatively rotatable.

Disposed within the casing 1 is slide bracket 30 which is movable up and down the casing. The bracket is retained by the flanges 4. The bracket carries an operating shaft 31 which extends thru the elongated slot 32 formed on the lever arm. The shaft 31 operating in the slot 32 forms a pivot means which provides for the lever and bracket to be relatively rotatable. The slot 32 permits relative sliding motion as between the bracket 30 and the lever arm 25 for purposes as will be apparent as the description proceeds.

It will be apparent from the inspection of FIG. 1 that with rotary motion of the carrier arm 2, the bracket 30 partakes of a sliding motion along the casing or conversely with sliding motion of the bracket 30 the carrier arm rotates. If the carrier arm moves counterclockwise as viewed in FIG. 1, the bracket slides down the casing and vice versa.

The open position of the hinge is defined by the engagement of the carrier arm tail 33 with the bottom 5 of the casing. The closed position of the hinge is defined by the shoulder 34 on the carrier arm engaged with the lanced section 35 on the pivot bracket.

The broil or partially open position is defined by a detenting arrangement and a locking mechanism which will be explained later.

A compression spring 36 is disposed within the casing 1. The top end of the spring is connected to the casing via the bracket 37. At the bottom, the spring is engaged with the bracket 30 and exerts a force thereon. The spring is retained in the casing as by the flanges 4. When the door is in the open position the spring is fully compressed (FIG. 1) and exerts its greatest force. When the door is in the closed position the spring is partially expanded (FIG. 4) and exerts the least force. The force of the spring 36 is transmitted thru the bracket 30, pivot 31, lever arm 25 and thence to the carrier arm 2.

The spring develops a torque on the carrier arm around the pivot 3. This torque acts to rotate the arm to the closed positioon.

When the door is mounted on the carrier arm and moved as between the open and broil positions, the weight of the door creates a torque on the carrier arm acting around the pivot 3 in a direction opposite to the torque created by the spring 36.

When the door is in the open position, the effective weight of the door generates the largest torque with respect to the pivot 3 and the compression spring 36 being fully compressed, also exerts the maximum torque with respect to the pivot 3. As the door begins to move clockwise toward the broil position the effective weight becomes less and the spring 36, by expanding, commensurately generates less torque. The weight of the door is counter balanced by the force of the compression spring 36. As understood in the trade, the term counter balancing means a force which may be of a magnitude simply to overcome part of the door weight so that the door is easier to swing upwardly or downwardly or may refer to a force of magnitude which is enough to effectively cancel out the weight of the door whereby the door will remain stationary if placed in any position between open and broil.

The latch 23 is carried by a latch arm 38 connected to the carrier arm as by pivot 39. The spring 40 mounted on the carrier arm normally biases the latch arm so that the latch 23 extends outwardly as indicated in FIG. 1. As previously indicated this locks the door on the carrier arm. The outward position of the latch is determined by the engagement of the boss 41 on the latch arm 38 engaging the bottom of the aperture 42 in the carrier arm (FIG. 6).

When the carrier arm approaches the broil position the followers or cam rollers 44 and 45 (see FIG. 4) mounted on the pivot shaft 31 become operative respectively to effect the detenting or holding of the arm in the broil position and the disabling of the latch 23 as explained below.

As the carrier arm approaches the broil position the surface 46 on the arm engages the cam roller 44 and with further rotation the detent 50 accepts the roller 44. It will be noted that the pin 31 is spaced away from the bottom of the slot 32. This allows the pressure of spring 36 to be transmitted from the bracket 30, pin 31 directly to the roller 44 so that the roller is held tightly in the detent 50. The foregoing structure forms a holder mechanism which holds the carrier arm (and oven door) in the broil or partially open position.

Also with the approach of the carrier arm to the broil position the surface 51 on the latch arm engages the cam roller 45 and this causes the latch arm 41 to be rotated clockwise against the force of the spring 40. The latch 23 moves out of the slot in the socket. Without interference from the latch 23, the door can be lifted off the carrier arm.

When the carrier arm is moved from the broil position toward the closed position the cam roller 44 runs along surface 52 on the carrier arm. This lifts the roller 44 and pivot shaft 31 upwardly, the latter motion being accomodated by the fact that the pivot shaft 31 is free to move upwardly in the slot 32. The spring 36 therefore exerts pressure on the bracket 30, the shaft 31 and on the roller 44 which forces the carrier arm to the closed position. When a door is mounted on the carrier arm, the arm assumes a more vertical position than is indicated in FIG. 3, accordingly the surface 52 is contoured so that the force of the spring is effective to maintain the door closed.

Also in the closed position, the surface 53 of the lever arm engages the cam roller 45 so that the lever arm remains substantially in the same position as it was in the broil position. If desired, the surface 53 on the latch arm can be formed so that the latch 23 assumes its locking position when the carrier arm is in the closed position.

As mentioned heretofore one of the principal features of the invention is a latch or holder mechanism to secure the arm in the broil position (or partially open

position) during assembly of the hinge to the oven and when the door is removed for cleaning. This is explained following.

When the hinge is free from the door and the carrier arm is in the broil position it will normally stay in such position provided it is not jarred of otherwise knocked out of detent **50.**

The hinge is mounted on the oven by securing the casing to the back side of the oven frame. The oven frame has a slot which allows the pivot bracket and carrier arm to project outwardly in front of the oven for receiving the door. The slot accommodates motion of the carrier arm.

In some ovens the frame is open and the portion to which the hinge is attached is readily accessible from the outside. Other ovens are constructed so that the portion on which the hinge is attached is enclosed within a cover or housing.

With the first type of oven the hinge is put into broil position, the casing is held in the fingers and the hinge moved so that the carrier arm and pivot bracket are inserted thru the frame slot and the bottom **5** of the casing **1** is brought up to the back part of the frame. The casing is then secured in place.

With the second type of oven, the hinge is put into the broil position, the carrier arm held in the fingers, the hinge moved so that the casing is inserted thru the frame slot and then brought up on the back side of the frame and secured in place.

With either type of oven, the assembler must exercise caution to avoid jarring the hinge because this causes the arm to come out of the broil detent and to be moved very rapidly and firmly to the closed position by the spring. If the operator's fingers are between the carrier arm and the casing there is great danger of cutting and fracture of fingers. Moreover, if the hinge closure takes place while the hinge is being inserted or is secured in place by the carrier arm, by moving to the closed position will strike and damage any stainless steel or porcelain bezel or rim on the oven frame. As a consequence, the assembler must move slowly and carefully and this cuts down production.

It will be understood that the same danger of injury and damage are present when the door is removed for cleaning.

The invention provides a latch and latch control mechanism therefor which will automatically lock the arm in the broil position when the carrier arm is free from the door, but which will be rendered inoperative when the door is on the carrier arm. With latch arrangement, the carrier arm cannot be jarred loose from the broil position and thus injury to the assembly personnel and damage to ovens are eliminated and production of ovens increased and that the consumer's ovens and fingers are likewise protected.

With reference to FIGS. **1, 5** and **6** the latch is in the form of a bar which extends thru slot **55** in the carrier arm and is adapted to be moved along the slot from one end to the other. The bar rotates with the carrier arm.

As shown in FIG. **1,** the bar **54** is positioned at the inner end of the slot **55** which is the operative position. The bar occupies a radial position with respect to the pivot **3** which is the same as the radial position of a locking land **56** formed in pivot bracket **24.** Therefore, when the carrier arm is rotated clockwise the bar will engage the land **56.** With engagement of bar **54** and land **56** the force of spring **36** cannot move the carrier arm to the closed position. The land **56** is located so that the carrier arm is stopped at the broil position.

When the bar is at the outer end of slot **55** which is the inoperative position it occupies a radial position with respect to the pivot **3** which is the same as the radial position of the recess **57** formed on the pivot bracket **24.** Therefore when the carrier arm is rotated clockwise the bar will slip into the recess **57** and the bar will not offer interference to the carrier arm moving to the closed position.

The bar **54** is moved to the innermost radial position when the carrier arm is free from the door and is moved to outermost radial position when the door is placed on the carrier arm. The foregoing motion is accomplished by a latch operating mechanism including a cam spring arrangement.

The cam or actuating arm **60** is connected to the bar **54.** A control spring **61** is connected to the cam **60** and also is firmly crimped to the carrier arm as indicated at **62.** When the carrier arm is free from the door socket, the spring **61** holds or biases the cam to the position shown in FIG. **1** so the bar **54** occupies its locking or operative position. When the door is placed on the arm, the socket engages the cam **60** and pushes the same so that the bar **54** moves to the outward or inoperative position in slot **55.**

The bar **54,** cam or actuating arm **60** and control spring **61** are made from a unitary piece of spring steel wire so that a single wireform comprises the latch and latch control mechanism.

In FIGS. **7, 8** and **9** I have shown a modified form of the latch and latch operating mechanism.

The bar **63** is rotatably mounted on the carrier arm as by pivot **64.** The cam **65** is connected to the bar so as to be rotatable therewith. The latch spring **40** is modified as by that an end **66** extends downwardly to engage the finger **70** on the cam. The end **66** forms a control spring. When the carrier arm is free from the door socket the spring **66** biases the cam and bar to rotate the same to the position shown in FIG. **7.** As will be observed the bar is in juxtaposition with respect to locking land **71** on the pivot bracket **24.** This is the operative locking position because motion of the carrier arm clockwise away from the broil position will cause the bar **63** to engage the land **71** and prevent rotation. The force of the spring **36** cannot move the carrier arm out of the broil position to the closed position.

When the door is put on the carrier arm, the door socket engages the cam **65** and rotates the same clockwise to the position shown in FIG. **8.** This places the bar **63** at an angle with respect to the locking land **71.** In this position of the bar, rotation of the carrier arm will cause engagement between the end **63***a* of the bar and the locking land. With further carrier arm rotation, the engagement will affect a clockwise rotation of the bar **63** to the position as shown in FIG. **9.** The bar will offer no resistance to rotation of the carrier arm to the closed position.

FIGS. **10, 11, 12** and **13** illustrate another embodiment of the latching arrangement.

A bar **73** is rotatably mounted on the shaft **74** supported by the post **75** fixed to the pivot bracket **24.** The bar is positioned adjacent a slot **76** formed in the pivot bracket. The carrier arm also has a slot **80.** When the carrier arm is in the broil position of FIG. **10** the two slots are in alignment.

Fixed to the bar **73** is a cam **81** which rotates in unison with the bar. On the shaft **74** is a control spring **82**, one end **83** of which bears against the under side of the cam **81**. The spring biases the cam and bar so that the bar tends to rotate into the slot **76** (into the paper as viewed in FIG. **10**).

Thus when the hinge is free from the socket and the carrier arm is in the broil position, the spring **82** rotates the cam and bar to the position as shown in FIG. **12**. The bar **73** extends across the slots **76** and **80** into the path of rotation of the carrier arm and prevents rotation of the carrier arm out of the broil position. This is the operative or locking position of the bar **73** and the force of spring **36** cannot move the carrier arm out of broil to closed position.

When the door is placed on the carrier arm the socket engages the cam **81** and rotates the cam and bar to the position as shown in FIG. **13** out of the path of rotation of the carrier arm. The bar is now free from the slots and the carrier arm is rotatable. The position of the bar in FIG. **13** is the inoperative position.

I claim:

1. A hinge structure for a cook oven having a hollow body with a door providing access to the body, the hinge permitting the door to rotate relative to the body in a vertical direction as between open, partially open and closed positions, the hinge comprising:

an elongated casing adapted to be mounted in a fixed position on the body wherein the casing extends vertically and mounts the hinge on the oven;

a rotatable carrier arm constructed to fit into a socket on the oven door to thereby support the door for rotation therewith;

pivot means connecting the casing and the carrier arm and providing for the arm to rotate relative to the casing in a vertical direction as between the open and closed positions;

operating mechanism including a compression spring connected between the carrier arm and the casing, the spring exerting a force on the carrier arm to cause rotation of the arm toward the closed position when the carrier arm is free from said socket;

latch means movable as between operative and inoperative positions; and

latch control mechanism for moving the latch to the inoperative position when the carrier arm is in the door socket so that the latch does not interfere with rotation of the carrier arm to closed position and also for moving the latch when the carrier arm is free from thedoor socket to the operative position so that the latch holds the carrier against the force of the spring in a partially open position, the latter position being for use when the hinge is being assembled to the oven.

2. A construction in accordance with claim **1** wherein:

said pivot means includes a pivot bracket connected to the casing and extending outwardly therefrom, the bracket having a locking land formed thereon;

said latch means includes a bar extending thru a slot on the carrier arm and movable as between opposite ends of the slot, one end of the slot being the operative position of the bar and the other end being the inoperative position;

said latch control mechanism includes a cam and a control spring, the cam being connected to the bar and adapted to engage the door socket and be moved in a direction to move the bar to the inoperative position wherein the bar does not engage the locking land with rotation of the carrier arm, and the control spring being mounted on the carrier arm and connected with the cam and biasing the cam to move in a direction to move the bar to the operative position wherein the bar engages the locking land at a predetermined position of the carrier cam to establish said partially open position.

3. A construction is accordance with claim **1** wherein:

said pivot means includes a pivot bracket connected to the casing and extending outwardly therefrom, the bracket having a locking land formed thereon;

said latch includes a bar mounted on said carrier arm for rotation as between the operative and inoperative positions;

said latch control mechanism includes a cam and a control spring, the cam being connected to the bar for rotation therewith and adapted to engage the door socket and be rotated in a direction to rotate the bar to a position wherein rotation of the carrier arm out of the partially open toward the closed position causes the bar to engage the locking land and the engagement and further rotation of the carrier arm rotating the bar to the inoperative position and the control spring being mounted on the carrier arm and connected with the cam and biasing the cam to rotate in a direction to rotate the bar to the operative position wherein the bar engages the locking land at a predetermined position of the carrier arm to establish said partially open position.

4. A construction in accordance with claim **1** wherein:

said pivot means includes a pivot bracket connected to the casing and extending outwardly therefrom;

said latch means includes a bar mounted on said pivot bracket and a slot formed in said carrier arm for receiving said bar, the bar being mounted for rotation between the operative and inoperative positions;

said latch control mechanism includes a cam and a control spring, the cam being connected to the bar for rotation therewith and adapted to engage the door socket and be rotated in a direction to rotate the bar to the inoperative position wherein the bar cannot be received by said carrier arm slot and the control spring being mounted on the carrier arm and connected with the cam and biasing the cam to rotate in a direction to rotate the bar to the operative position wherein the bar is received by the carrier arm slot at a predetermined position of the carrier arm to establish said partially open poisition.

5. A construction in accordance with claim **1** wherein said operating mechanism includes:

a lever arm;

pivot means connecting the lever arm to the carrier arm and providing for the arms to be rotatable relative to one another;

a bracket slidably mounted on said casing;

pivot means connecting the lever arm and the bracket and providing for the same to be rotatable relative to one another, one end of the compression spring being connected to said bracket and said spring force being transmitted to the carrier arm via the bracket and the lever arm.

6. A construction in accordance with claim **5** wherein said latch control mechanism and said latch means are constructed from a single wireform.

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