

Dec. 18, 1951

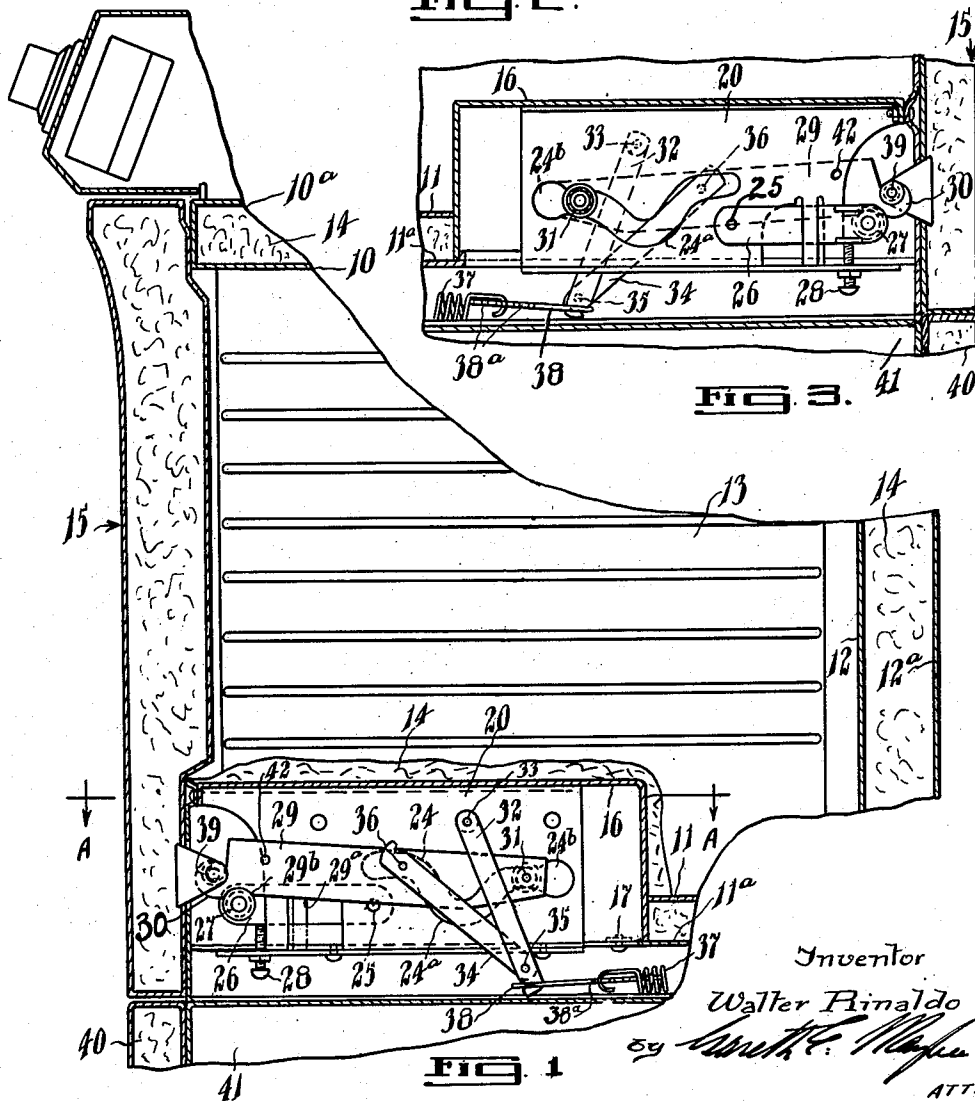
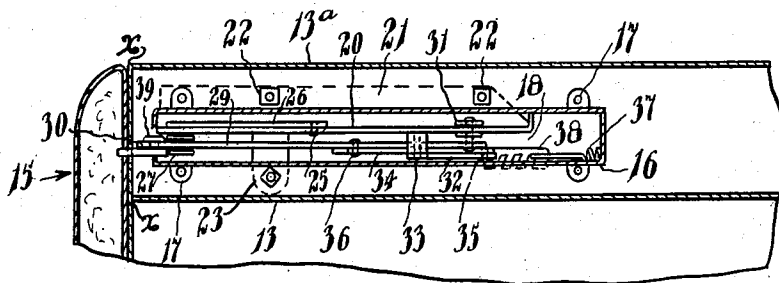
W. RINALDO

2,579,091

HINGE MECHANISM FOR RANGE DOORS

Filed April 20, 1948

2 SHEETS—SHEET 1



Inventor
Walter Rinaldo

Walter Rinaldo

by *Wm. H. H. H. H.*

ATTN.

Dec. 18, 1951

W. RINALDO

2,579,091

HINGE MECHANISM FOR RANGE DOORS

Filed April 20, 1948

2 SHEETS—SHEET 2

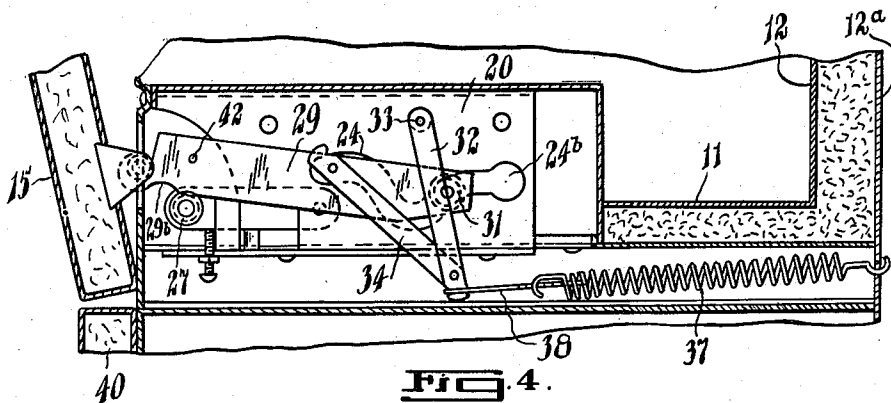


FIG. 4.

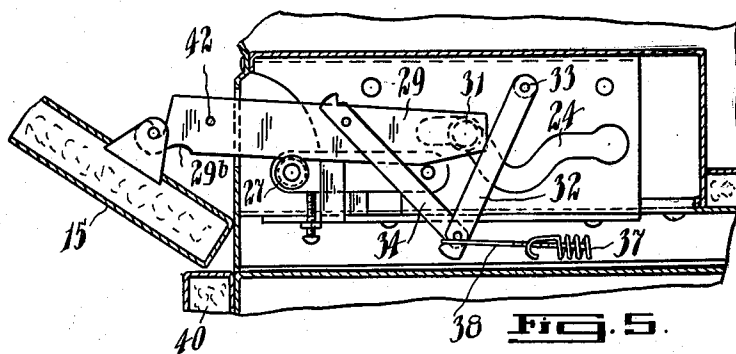


FIG. 5.

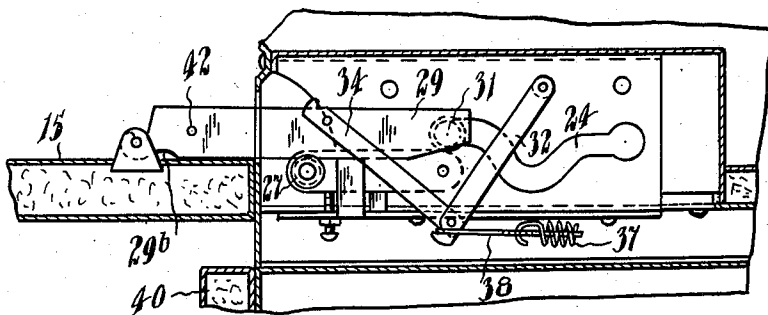


FIG. 6.

Inventor

Walter Rinaldo

by *Wm. E. Mayhew*
ATTY.

UNITED STATES PATENT OFFICE

2,579,091

HINGE MECHANISM FOR RANGE DOORS

Walter Rinaldo, Toronto, Ontario, Canada, assignor to Moffats Limited, Weston, Ontario, Canada, a corporation

Application April 20, 1948, Serial No. 22,043

14 Claims. (Cl. 126—194)

1

This invention relates to door structures, and more particularly to a hinge mechanism for a range oven having a drop door that swings between a substantially vertical position and a substantially horizontal open position, and it has for its main object to provide a hinge mechanism whereby the door may be readily mounted on the oven and will present a pleasing appearance. Although the invention is particularly disclosed as applied to the oven of a cooking range, it will appear from the following description that its construction is such as to make it adaptable for doors used in many and varied capacities.

Oven door hinges as ordinarily constructed are in the form of castings which are as a consequence subject to frequent breakage both at the time of fabrication of the range and when in use. Therefore one of the main objects of the present invention is to provide a hinge mechanism the parts of which are sheet steel stampings, thereby reducing the incidence of breakage both during manufacture and during use of the range.

Another object of the invention is to provide a hinge mechanism of such construction as to make it possible for the door to be easily, quickly and readily attached and detached from the range and to accomplish this without in any manner disturbing or removing the hinge parts.

It is a further object of this invention to provide a hinge mechanism for an oven door which enables the door to be tightly closed when baking so as to prevent the loss of heat at the front; moreover the invention provides for means to limit the downward movement of the door to its horizontal open position and also for means to hold the door in a partially open position during broiling so as to permit hot gases to escape rapidly from the oven.

It is a further object of the invention to provide a hinge construction whereby the main oven door which is usually of considerable thickness, or which is possibly of considerable convexity in horizontal cross-section, may be located immediately above a warming oven door with little or no space between the adjacent edges of the two doors and this without the lower edge of the main oven door ever hitting or striking the top edge of the warming oven door. This latter object is achieved by so constructing the hinge mechanism that the door bearings thereof move outwardly and lift upwardly as the door is gradually opened.

Still another object of the invention is to pro-

2

vide a door hinge mechanism which has a completely smooth action, free from jarring or rough movement in its operation.

A further object of the invention is to provide hinge mechanisms at both sides of the door which can easily be adjusted during assembly so as to level the door thereby reducing manufacturing costs especially in lining up the door, so that fractional differences in manufacture of the door and of the hinge mechanism will not materially affect final assembly and fitting of the door to the range.

All of the foregoing and still further objects and advantages of the invention will become apparent from a study of the following specification, taken in conjunction with the accompanying drawings, wherein like characters of reference indicate corresponding parts throughout the several views and wherein:

Fig. 1 is a vertical section through a typical range, the portions of the range which are not particularly pertinent to this invention being broken away, and a portion of the left-hand side wall of the range being also shown broken away to better illustrate the hinge mechanism;

Fig. 2 is a fragmentary horizontal sectional view through the line A—A of Fig. 1;

Fig. 3 is a fragmentary section similar to Fig. 1 taken from the opposite side of the hinge mechanism;

Fig. 4 is a fragmentary vertical section similar to Fig. 1 illustrating the relative positions of the parts of the hinge mechanism when the door is in the broiling or partially open position;

Fig. 5 is a fragmentary vertical section similar to Fig. 1 showing the relative positions of the parts of the hinge mechanism when the door is in a more fully open position than shown in Fig. 4; and

Fig. 6 is a fragmentary vertical section similar to Fig. 1 showing the relative positions of the parts of the hinge mechanism when the door is in the fully open or horizontal position.

Referring particularly to Fig. 1 a typical range includes a main oven having a top wall, a bottom wall, a rear wall and side walls, the top wall comprising two spaced enamelled metal plates 10 and 10^a, the bottom wall comprising similar spaced plates 11 and 11^a, the rear wall comprising also spaced plates 12 and 12^a, and each of the side walls comprising spaced plates 13 and 13^a. The spaces between each pair of sheets are filled with glass wool or other suitable heat insulating material 14. The oven door which is generally indicated at 15 is of a simi-

3

lar double wall construction, and is also filled with heat insulating material and is consequently relatively heavy.

Since the two hinge mechanisms at each side of the oven are of similar construction, only one is illustrated and described, namely the hinge which is in the left-hand side wall of the range when viewed from the front. The hinge mechanism is mounted inside the side walls of the oven, and in the case of the left-hand hinge mechanism it is mounted between the two spaced plates 13 and 13^a, being suitably covered by a shielding box 16 which is open at the bottom and is suitably secured to the bottom plate 11^a by bolts 17. The lower open end of the shielding box 16 registers with openings 18 provided in the bottom plates 11 and 11^a and thus the whole hinge mechanism may be inserted on assembly in the said openings or may be removed therefrom if necessary for repair.

The hinge mechanism comprises a vertically disposed frame member 20 which is flanged on all sides to give it greater strength, and the lower flange 21 of which is secured by means of bolt and nut assemblies 22 to the bottom wall 11^a of the oven adjacent one edge of the opening 18 provided therein. In order to more securely attach the frame member to the bottom wall, a lug extension 23 of the frame member is also suitably attached to the bottom wall adjacent the opposite edge of the aforesaid opening.

Provided in the rear part of the frame member 20 is a cam track 24 which has a steeply inclined shaped portion 24^a intermediate its ends. Pivotaly mounted on the frame member by means of pin 25 is a bar 26 having a suitable roll-bearing type roller 27 at its front end which provides a fulcrum for a purpose to be hereinafter described. The elevation of the fulcrum provided by roller 27 can easily be varied by merely adjusting screw 28 threaded in the lower flange 21 of the frame member 20, the lower edge of the bar 26 being supported by the tip of the said screw 28. The screw 28 is easily accessible from underneath the oven, or in the case of a range having a warming oven as shown in Fig. 1, from the inside of the said warming oven.

A hinge arm 29 provided with a hook type door supporting bearing 30 at its front end has at its rear end a roll-bearing type follower 31 adapted to travel in the cam track 24. It will be noted that the cam track is enlarged at 24^b in order to provide for the insertion of the follower 31 in the track. The lower edge 29^a of the hinge arm is adapted to translate on and be supported by the fulcrum provided by the roller 27. At the front end of the said lower edge is a recess 29^b which provides what is effectively a cam surface.

One end of a link 32 is pivotally mounted to the frame by means of a rivet 33, and to the lower end of the said link 32 is connected one end of another link 34 by means of a pivot pin or rivet 35. The other end of link 34 is pivotally connected to the hinge arm 29 by means of a rivet 36. A spring 37 is connected at one end by means of a link 38 to a hook in the lower end of link 32, the other end of the said spring being suitably secured to a fixed portion of the range. The spring provides biasing means tending to pull the hinge arm inwardly so as to counterbalance the door. The tension of the spring and hence its relative force may be adjusted by selectively hooking it to different teeth 38^a provided in the link 38.

The links 32 and 34 which, as previously de-

4

scribed, are pivoted to each other, to the frame, and to the hinge arm, help to provide a more secure hinge mechanism, and moreover an analysis of the forces transmitted through the links by the spring to the hinge arm shows that the hinge arm is not only pulled inwardly by the spring but it is also pulled downwardly. The ingenious linkage mechanism also enables the spring to stretch along a practically horizontal path when it is tensioned, whereas were the spring connected directly to the hinge arm, say by means of a downwardly extending bar rigidly welded thereto, the spring would have a considerable downward component of motion as the rear end of the hinge arm follows the slope in the cam track.

The hinge pin 39 of the door 15 is pivoted in the hook type bearing 30 at the front end of the hinge arm. As will be seen from Fig. 5, as the door is gradually opened its lower edge fulcrums against the front edge of the oven, and as the cam surface 29^b passes over the roller 27 the front end of the hinge arm is initially lifted upwardly. Thus the door actually lifts upwardly and thereby its front lower edge clears the door 40 of the warming oven 41 immediately below it. Therefore despite the fact that the door 15 of the main oven and the door 40 of the warming oven are very close to each other, the lower edge of the main oven door and the top edge of the warming oven door never strike each other. The hinge mechanism disclosed and claimed herein therefore makes it possible for range designers to incorporate in ranges doors which are of considerable convexity in horizontal cross-section.

As the door moves from the position shown in Fig. 4 to that shown in Fig. 5 it will be seen that the hinge arm translates further outwardly, and its front end moves still higher upwardly due to the fact that the roller 31 at the rear of the hinge arm is moving downwardly in the sloping cam track and consequently the hinge arm is fulcruming about roller 27. Thus the upward movement of the front end of the hinge arm is due initially to the fact that the cam recess 29^b provided in the arm 29 "climbs over" the roller 27, and subsequently the front end of the hinge arm moves upwardly still further because of the fulcruming of the hinge arm about roller 27 as the rear end dips downwardly as it follows the cam track. It is therefore within the scope of this invention to provide means to elevate the bearing of a door by either of the aforescribed features or by combination of both of them.

It should be noted that the co-operating action between the roller 27 and the cam surface 29^b taken in conjunction with the co-operating action between the roller 27 and the cam track 24 provides for an initial upward movement of the bearing end of the hinge arm. However, as the hinge arm passes from the position shown in Fig. 5 to that shown in Fig. 6 its bearing end actually moves downwardly, but the total upward movement of the front end of the hinge arm when the door is moved from an open to a closed position is greater than the total downward movement. Thus the bearing end of the hinge arm is at a higher elevation when the door is fully opened than when the door is completely closed.

When the door is in the position shown in Fig. 6, that is in the fully open position, its weight is more than sufficient to counterbalance the force of the biasing means transmitted through the hinge arm by means of the aforementioned link-ages 32, 34 and 38.

5

The cam track is so constructed that when the door is in the position shown in Fig. 4, neither the weight of the door whereby it tends to open nor the force provided by the biasing means which tends to close the door are sufficient per se to move the follower 31 through the inclined portion of the cam track, and thus the door remains balanced in substantially the position shown in Fig. 4. To either open the door fully or close it completely from the position shown in Fig. 4 it is necessary for the operator to give the door a slight push or pull in the desired direction.

Referring again to the cam recess 29^b provided at the front of the hinge arm, apart from the fact that it provides for the initial lifting upward of the door, it also causes the door when closed to bear very tightly against the frame. This is due to the fact that, as previously stated, the arrangement of the linkages co-operating with the biasing means pull the hinge arm downwardly thus tending to draw the cam recess 29^b in closer registration with the roller 27.

One important advantage provided by the hinge mechanism disclosed and claimed herein is that it permits the use of a door having a large surface contact with the edges at the opening of the oven, for example as shown at x—x in Fig. 2. The use of a hinge which translates horizontally as the door is moved from one position to another enables the whole door to be pulled inwardly and in intimate contact with the edges of the oven when it is closed.

Near the front extremity of the hinge arm 29 is drilled a hole 42 in a position such that a rod or nail may be inserted into the said hole when the door is slightly opened and the hinge arm is at a position such that the said hole appears outside the door opening. If the door is then released, the nail or rod engages with the door frame and prevents the door from being returned to its closed position; the door may then be removed from the hook at the end of the hinge arm if desired. Thus an additional advantage of the hinge construction disclosed herein is the easy removability of the door for any desired purpose.

It is thought that the construction and use of the invention will be apparent from the above description of the various parts and their purpose. It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention or the scope of the subjoined claims.

What I claim as my invention is:

1. A hinge mechanism for a door, said mechanism comprising a frame member, a hinge arm translatably mounted on the frame member, a bearing on the outer end of the hinge arm for pivotally mounting the door thereon, a fulcrum on the frame member, an edge of the hinge arm engaging the said fulcrum, and biasing means connected to the hinge arm and adapted to pull the hinge arm inwardly and downwardly, the fulcrum engaging edge of the hinge arm being provided with a recess at a point such that the fulcrum is adapted to engage in the said recess, the downward pull of the aforesaid biasing means on the hinge arm being adapted to draw the recess in registration with the fulcrum to hold the door in closed position.

2. In combination, a wall provided with an opening, a door for closing said opening and

6

hinging mechanism for said door comprising a frame member, a hinge arm member translatably mounted on the frame member, a bearing on the outer end of the hinge arm member in which the door is pivotally mounted, and a fulcrum on one of said members, an edge of the other member being supported by the fulcrum as the hinge arm is translated forwardly by the swinging of the door from a closed to an open position, the fulcrum being vertically adjustable with respect to the member on which it is mounted so as to alter the elevation of the bearing end of the arm.

3. In combination, a wall provided with an opening, a door for closing said opening and hinging mechanism for said door comprising a frame member, a hinge arm member translatably mounted on the frame member, a bearing on the outer end of the hinge arm member in which the door is pivotally mounted, a bar having a fulcrum at one end, its other end being hinged to one of said members, and means to vertically adjust the fulcrum end of the said bar, an edge of the other member being supported by the fulcrum as the hinge arm member is translated forwardly by the swinging of the door from a closed to an open position, the adjustment of the bar enabling the elevation of the bearing end of the arm to be altered.

4. In combination, a wall provided with an opening, a door for closing said opening and hinging mechanism for said door comprising a frame member, a hinge arm translatably mounted on the frame member, a bearing on the outer end of the hinge arm member in which the door is pivotally mounted, a bar having a roller at one end, its other end being pivotally mounted on the frame member, an edge of the hinge arm rolling on the roller as the hinge arm is translated forwardly by the swinging of the door from a closed to an open position, and means to vertically adjust the roller end of the bar, the said adjustment altering the elevation of the bearing end of the arm.

5. In combination, a wall provided with an opening, a door for closing said opening and hinging mechanism for said door comprising a frame member, a hinge arm translatably mounted on the frame member, a bearing on the outer end of the hinge arm in which the door is pivotally mounted, a bar having a roller at one end, its other end being pivotally mounted on the frame member, an edge of the hinge arm rolling on the roller as the hinge arm is translated forwardly by the swinging of the door from a closed to an open position, and a substantially vertically disposed screw threaded in the frame and having its head accessible from thereunder, its tip engaging the lower edge of the aforesaid other end of the bar, the adjustment of the said screw turning the bar about its pivot on the frame member thereby vertically adjusting the roller end of the bar and altering the elevation of the bearing end of the arm.

6. In combination, a wall provided with an opening, a door for closing said opening and hinging mechanism for said door comprising a frame member, a hinge arm member translatably mounted on the frame member, a bearing on the outer end of the hinge arm member in which the door is pivotally mounted, a fulcrum at the front end of one of said members, an edge of the other of said members bearing on the fulcrum, a follower on one of the members at a location spaced from the fulcrum, and a cam track carried by the other member along which the fol-

lower travels as the hinge arm member is translated forwardly by the swinging of the door from a closed to an open position.

7. In combination, a wall provided with an opening, a door for closing said opening, and hinging mechanism for said door comprising a frame member, a hinge arm member translatablely mounted on the frame member, a bearing on the outer end of the hinge arm member in which the door is pivotally mounted, a fulcrum at the front end of one of said members, an edge of the other of said members bearing on the fulcrum, a follower on one of the members at a location spaced from the fulcrum, and a cam track carried by the other member along which the follower travels as the hinge arm member is translated by the swinging of the door from one position to another, the said track having an inclined portion intermediate its ends so that as the follower passes along the said portion the inner end of the hinge arm member will dip downwardly, and due to the pivoting of the hinge arm about the fulcrum its outer end will consequently move upwardly, thereby elevating the door.

8. In combination, a wall provided with an opening, a door for closing said opening and hinging mechanism for said door comprising a frame member, a hinge arm member translatablely mounted on the frame member, a bearing on the outer end of the hinge arm member in which the door is pivotally mounted, biasing means connected to the other end of the hinge arm member and adapted to pull it inwardly, a fulcrum at the front end of one of the members, an edge of the other of said members bearing on the fulcrum, a follower on one of the members at a location spaced from the fulcrum, and a cam track carried by the other member along which the follower travels as the hinge arm member is translated by the swinging of the door from one position to another, the said track having an inclined portion intermediate its ends, the effective slopes of the said inclined portion being such that when the follower passes along the said portion neither the weight of the door which tends to open the door nor the force provided by the biasing means which tends to close the door are per se sufficient to move the follower along the inclined portion, thus enabling the door to remain balanced in a partially open position.

9. In combination, a wall provided with an opening, a door for closing said opening and hinging mechanism for said door comprising a frame member, a hinge arm member translatablely mounted on the frame member, a bearing on the outer end of the hinge arm member in which the door is pivotally mounted, a fulcrum at the front end of the frame member, an edge of the hinge arm member bearing on the fulcrum, a follower on one of the members at a location spaced from the fulcrum, and a cam track carried by the other member along which the follower travels as the hinge arm member is translated forwardly by the swinging of the door from a closed to an open position.

10. In combination, a wall provided with an opening, a door for closing said opening and hinging mechanism for said door comprising a frame member, a hinge arm member translatablely mounted on the frame member, a bearing on the outer end of the hinge arm member in which the door is pivotally mounted, a fulcrum at the front end of the frame member, an edge of the hinge arm member bearing on the fulcrum, a fol-

lower on one of the members at a location spaced from the fulcrum, and a cam track carried by the other member along which the follower travels as the hinge arm member is translated by the swinging of the door from one position to another, the said track having an inclined portion intermediate its ends so that as the follower passes along the said portion the inner end of the hinge arm member will dip downwardly and due to the pivoting of the hinge arm about the fulcrum its outer end will consequently move upwardly, thereby elevating the door.

11. In combination, a wall provided with an opening, a door for closing said opening and hinging mechanism for said door comprising a frame member, a hinge arm member translatablely mounted on the frame member, a bearing on the outer end of the hinge arm member in which the door is pivotally mounted, biasing means connected to the other end of the hinge arm member and adapted to pull it inwardly, a fulcrum at the front end of the frame member, an edge of the hinge arm member bearing on the fulcrum, a follower on one of the members at a location spaced from the fulcrum, and a cam track carried by the other member along which the follower travels as the hinge arm member is translated by the swinging of the door from one position to another, the said track having an inclined portion intermediate its ends, the effective slopes of the said inclined portion being such that when the follower passes along the said portion neither the weight of the door which tends to open the door nor the force provided by the biasing means which tends to close the door are per se sufficient to move the follower along the inclined portion, thus enabling the door to remain balanced in a partially open position.

12. In combination, a wall provided with an opening, a door for closing said opening and hinging mechanism for said door comprising a frame member, a hinge arm member translatablely mounted on the frame member, a bearing on the outer end of the hinge arm member in which the door is pivotally mounted, a fulcrum at the front end of one of said members, an edge of the other of said members bearing on the fulcrum, a cam track carried by the frame member, and a follower at the inner end of the hinge arm member which travels along the track as the hinge arm member is translated by the swinging of the door from one position to another.

13. In combination, a wall provided with an opening, a door for closing said opening and hinging mechanism for said door comprising a frame member, a hinge arm translatablely mounted on the frame member, a bearing on the outer end of the hinge arm in which the door is pivotally mounted, a fulcrum at the front end of the frame member, an edge of the hinge arm bearing on the fulcrum, and a cam track carried by the frame member, a follower at the inner end of the hinge arm engaging the track, the edge of the hinge arm bearing on the fulcrum and the follower engaging the track respectively travelling on the fulcrum and along the track as the hinge arm is translated by the swinging of the door from a closed to an open position.

14. In combination, a wall provided with an opening, a door for closing said opening and hinging mechanism for said door comprising a frame member, a hinge arm translatablely mounted on the frame member, a bearing on the outer end of the hinge arm in which the door is pivotally mounted, a fulcrum at the front end of the

frame member, an edge of the hinge arm bearing on the fulcrum, a cam track carried by the frame member, a follower at the inner end of the hinge arm engaging the track, the edge of the hinge arm bearing on the fulcrum and the follower engaging the track respectively travelling on the fulcrum and along the track as the hinge arm is translated by the swinging of the door from a closed to an open position, a link having one end pivotally mounted on the frame, another link having one end pivotally mounted on the hinge arm, the other ends of the said links being pivoted to each other, and biasing means connected to the said other end of one of the said links being adapted to pull the hinge arm inwardly and downwardly to resist the swinging of the door to open position.

WALTER RINALDO.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,444,153	Harter -----	Feb. 6, 1923
1,717,221	Kahn -----	June 11, 1929
1,819,644	Herman -----	Aug. 18, 1931
1,963,388	Smith -----	June 19, 1934
2,234,259	Kelly -----	Mar. 11, 1941
2,401,977	Smallwood -----	June 11, 1946
2,447,341	Johnson -----	Aug. 17, 1948