Dec. 23, 1947. F. L. TALCOTT, JR 2,433,305

EXTENSION HINGE

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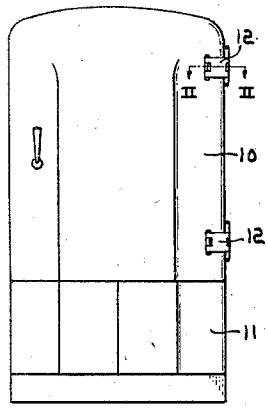


FIG. 1.

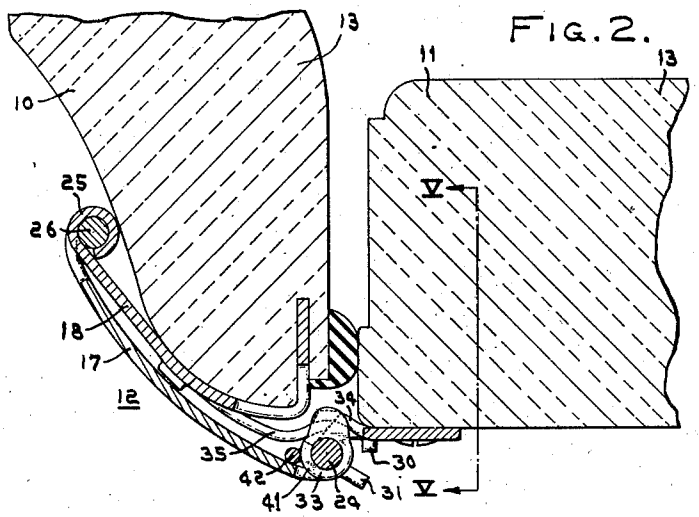
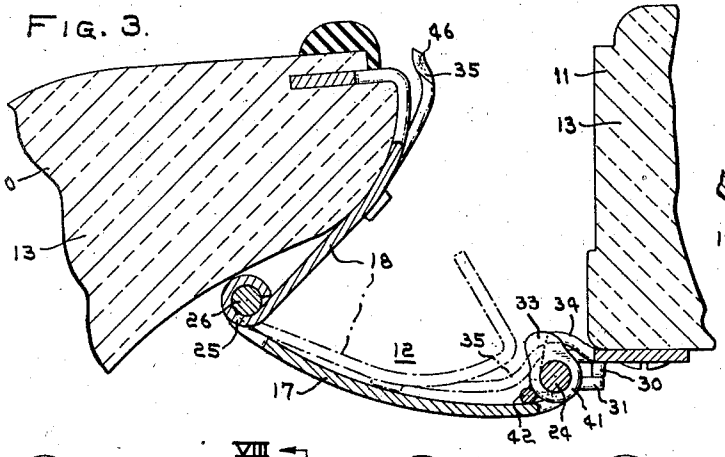


FIG. 2.

FIG. 3.



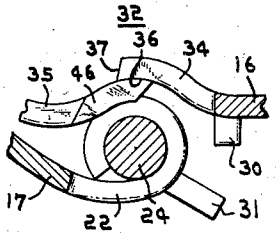


FIG. 4.

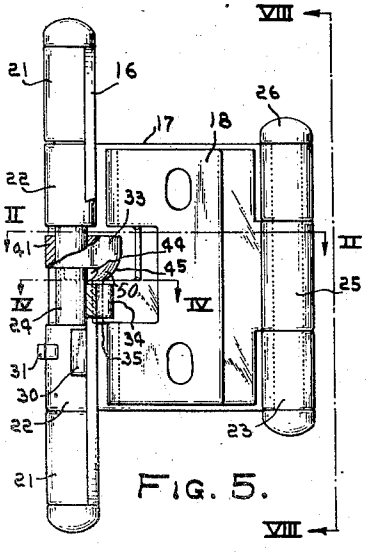


FIG. 5.

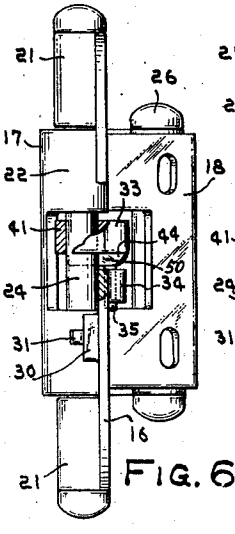


FIG. 6.

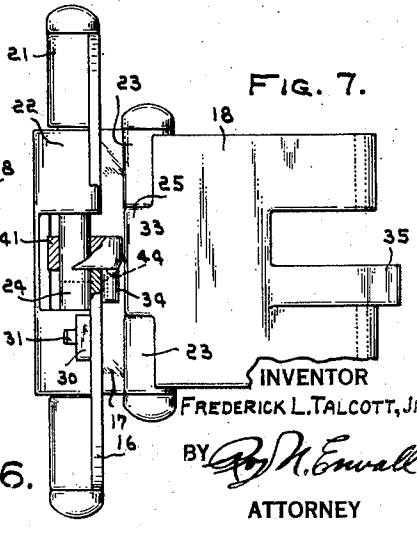


FIG. 7.

INVENTOR
FREDERICK L. TALCOTT, JR.
BY R. Ewall
ATTORNEY

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EXTENSION HINGE

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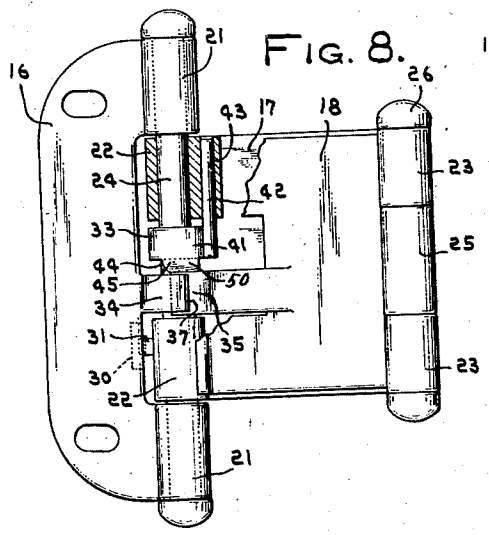


FIG. 8.

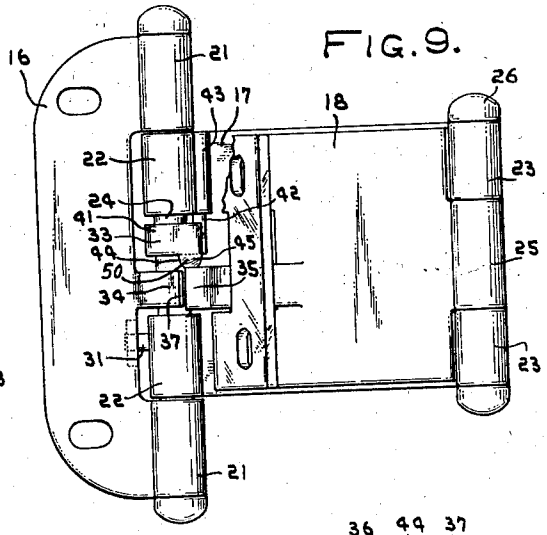


FIG. 9.

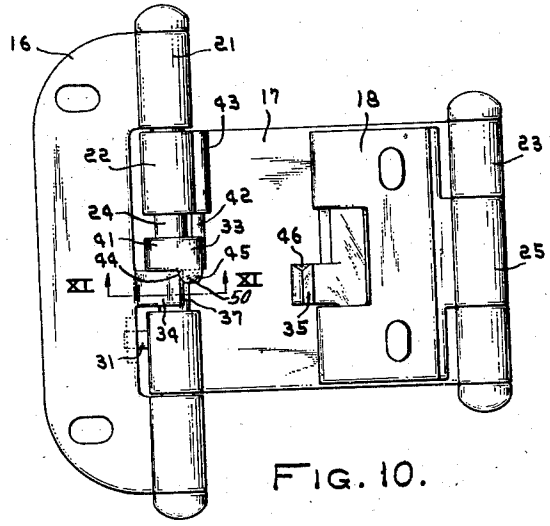


FIG. 10.

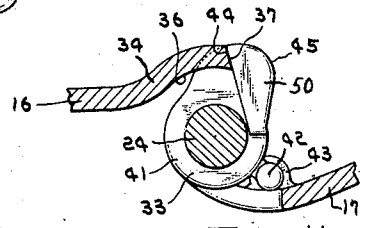


FIG. 11.

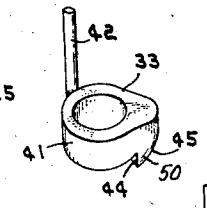


FIG. 12.

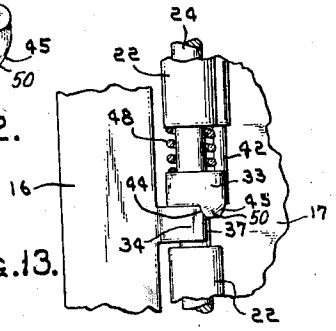


FIG. 13.

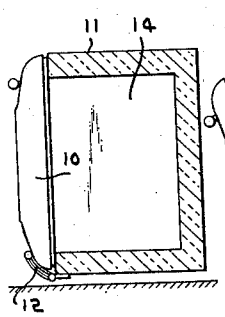


FIG. 14.

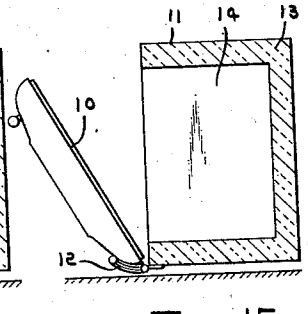


FIG. 15.

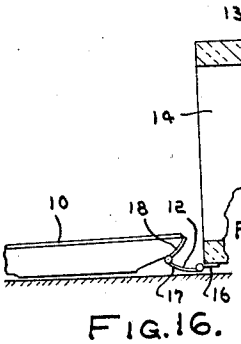


FIG. 16.

INVENTOR
FREDERICK L. TALCOTT, JR.
BY Roy N. Ewald
ATTORNEY

Patented Dec. 23, 1947 2,433,305

UNITED STATES PATENT OFFICE

2,433,305

EXTENSION HINGE

Frederick L. Talcott, Jr., Mansfield, Ohio, assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Application August 1, 1945, Serial No. 608,125

5 Claims. (Cl. 16—163)

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My invention relates to hinges and more particularly to extension hinges comprising two pivot axes, and it has for an object to provide an improved extension hinge of this character.

My invention, while not limited thereto, is particularly adapted to be used under conditions where a cabinet having a relatively thick door structure is placed close to a wall or in a corner. Under these conditions, standard, single hinge constructions will not always permit the door to be opened sufficiently to provide free access to the space normally covered by the door structure, such as, for example, a refrigerator cabinet. To provide for free access to the interior of the cabinet under the above-mentioned conditions, an extension hinge is usually provided so that, as the door is opened, it will swing about one pivot axis, and at a predetermined point, it will then swing about a second pivot axis; thus allowing the door to fully open and permit free access to the interior of the cabinet.

Although extension hinges have been suggested previously, most of them have had the defect that when the door is open, and it is desired to close the door, motion about both axes is liable to occur simultaneously, thus moving the door out of alignment with respect to its proper closed position. Also, if the operator does not follow a set sequence of steps or motions, the door will not close properly.

It is an object of my invention to provide an improved two-pivot extension hinge whereby the door or the like carried thereby opens and closes properly.

It is another object of my invention to provide an extension hinge which will have a reasonably low manufacturing cost and will not require expensive machining and special adjustment.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a front elevational view of a refrigerator cabinet showing my improved hinge applied thereto;

Fig. 2 is an enlarged sectional view of the hinge, in the door-closed position, taken substantially on the line II—II of Figs. 1 and 5;

Fig. 3 is an enlarged sectional view, similar to Fig. 2, showing the hinge in the door-open position;

Fig. 4 is an enlarged detail sectional view, taken on the line IV—IV of Fig. 5, of one of two locking means incorporated in the hinge;

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Figs. 5, 6 and 7 are partial sectional and side elevational views, as viewed along line V—V of Fig. 2 with the cabinet and door structures removed, showing the relative positions of the hinge in the fully closed, intermediate, or partially open and fully open positions, respectively;

Figs. 8, 9 and 10 are side elevational views, as viewed along line VIII—VIII of Fig. 5, showing the hinge in the fully closed, intermediate, or partially open and fully open positions, respectively;

Fig. 11 is an enlarged detail sectional view taken along the line XI—XI of Fig. 10;

Fig. 12 is a perspective view of a slidable locking member;

Fig. 13 is a partial elevational view of a slightly modified hinge; and

Figs. 14, 15 and 16 are diagrammatic views showing the motion of the door with my hinge applied thereto.

Referring now to the drawings in detail, there is shown a door structure 10 mounted on a cabinet 11, by means of a pair of my improved extension hinges 12. The door 10 and the cabinet 11 constitute, in the example shown, a refrigerator, with relatively thick walls 13, having a food storage compartment 14.

To permit the door 10 to open fully and provide free access to the food compartment 14, the extension hinges 12 each comprise a base plate 16 attachable to the cabinet, and an extension plate 17, hinged at one end to the base plate 16 and at its other end to a door plate 18, which is attachable to the door 10. The extension plate 17, interposed between the base and door plates 16 and 18, respectively, permits the door to pivot about two independent axes as shown particularly in Figs. 14 to 16, inclusive.

As is customary, the base plate 16, having spaced knuckles 21, is secured to the cabinet 11, adjacent the outer corner or jamb, and the extension plate 17 is provided with a pair of spaced knuckles 22 and 23, respectively, at opposite ends thereof. The pair of knuckles 22 are hinged to the knuckles 21 on the base plate 16 by a first hinge pin 24, to provide a first pivot axis for the hinge 12.

The door plate 18 has a knuckle 25, which is hinged to the knuckles 23 on the extension plate 17 by a second hinge pin 26 to provide a second pivot axis spaced from the first pivot axis, and the door 10 is secured to the door plate 18 by any suitable means.

In the example shown, the relatively thick door has rounded edges and, for the sake of appear-

ance, it is preferable to have the hinge 12 curved to conform substantially to the outer contour of the door edges, and to have the extension plate 17 overlap the exposed portion of the door plate 18. The hinge thus far described is more or less standard construction.

To prevent rotation about both hinge pivots simultaneously and to thereby insure proper sequential operation of the hinge mechanism 12, there is provided a rotation limiting mechanism. This rotation limiting mechanism comprises a stop 31, a lock, generally indicated at 32, and a sliding latch, generally indicated at 33.

The stop 31 comprises a rigid projection carried by the knuckle 22 of the extension plate 17, and positioned so as to engage an abutment 30, on the base plate 16, when the door is partly open. Referring to Figs. 2 and 3, it will be noted that, as the door is opened, the extension plate 17 and stop 31 carried thereby are rotated counterclockwise about the first hinge pin 24 until the stop 31 engages the abutment 30 and prevents further rotation of the door about the first pivot axis.

During the initial opening movement and final closing movement of the door, it is desirable to prevent rotation about the second hinge pin 26, so that the door traverses the same path in opening as in closing. This is accomplished by means of the lock 32, which includes an arcuate keeper 34 which extends from the forward edge of the base plate 16 intermediate the knuckles 21, and a cooperating arcuate latch 35 carried by or integral with the door plate 18, adjacent the end remote from its pivot pin 26. The keeper 34 may be formed integral with the base plate 16 and is disposed adjacent to, but spaced from the first hinge pin 24. This keeper 34 provides an inner abutment surface 36, engageable by the latch 35, and a second abutment surface 37, formed by the free end of the keeper and engageable by the sliding latch 33 in a manner described hereinafter.

With the door 10 in its closed position, the latch 35 is latched under the keeper 34 and engages its abutment surface 36, as shown particularly in Figs. 2, 4 and 8, and during the initial opening or final closing movement, locks the door plate 18 against rotation about the hinge pin 26 so that the door swings only about the pivot pin 24. This locking of the door plate continues as long as the keeper 34 overlaps the latch 35. Thus, it will be seen that, during the initial opening and final closing movement of the door, the door plate 18 and the extension plate 17 are locked against relative movement, and in opening the door the second hinge pin 26 rotates about the first hinge pin 24, from the position shown in Fig. 2 to that shown in Fig. 3.

When the hinge 12 reaches the position as shown by dot-and-dash lines in Fig. 3, and by Figs. 6 and 9, the lock 32 is released, since the keeper 34 no longer overlaps the latch 35, and the door and its door plate 18 are free to swing about the second pivot pin 26 to the fully open position, as shown in Fig. 16. Also, immediately after the lock 32 is released, the stop 31, carried by the extension plate 17, engages the abutment 30 on the base plate 16, preventing further opening movement of the extension plate 17 about the first hinge pin 24.

When the lock 32 is released, it is desirable to lock the extension plate 17 and door plate 18 against movement about the hinge pin 24 in a closing direction, and this is accomplished by the engagement of the sliding latch 33 and the keeper 34. The sliding latch 33, in the embodiment shown, comprises a washer-like member 41 slidably mounted on the first hinge pin 24 above the keeper 34. The sliding latch 33 is preferably freely slidable on the hinge pin 24, and its downward motion is in response to gravity, although it may be biased downwardly as by means of a spring 48 disposed between the upper knuckle 22 and the upper surface of the latch, as shown in Fig. 13.

The sliding latch 33 has an upwardly-extending guide pin 42 fixed thereto. The guide pin 42 is slidably engaged in a guide tube 43, fixed to the extension plate 17, so that the latch rotates with the extension plate 17 about the axis of pivot pin 24. The sliding latch 33 is also adapted to rest upon and be held in its disengaged position by the upper edge of the arcuate latch 35, when the door is in its closed position, and during the initial opening or final closing movement of the door 10.

The body member 41 of the sliding latch 33 is provided, on its underside, with a projection 50 having an engaging surface 44 and an adjacent cam surface 45. The cam surface 45 of the sliding latch 33 is so disposed as to be directly in line with the striking motion of the arcuate latch 35 of the lock 32 when the door is being closed. The engaging surface 44 of the projection 50 is positioned so as to be directly above and in line with the outer end 37 of the keeper 34 when the opening motion about the first pivot axis has terminated, and the lock 32 has been released.

As shown in dot-and-dash lines of Fig. 3 and in Figs. 6 and 9, the sliding latch 33, resting on the latch 35, has been rotated by the guide 43, on the extension plate 17, from its position shown in Figs. 2, 5 and 8. At this point, the stop 31 is engaged and the lock 32 is released. However, although the latch 35 is released by the keeper 34, the sliding latch 33 is still held in its disengaged or inoperative position by the latch 35. Any further motion of the door, in an opening direction, will cause the door 10 to pivot about the second hinge pin 26. As soon as motion occurs about the second hinge pin 26, the latch 35, moving with the door plate 18 away from the keeper 34, releases or allows the sliding latch 33 to move downwardly to its engaged position. As the sliding latch moves down, the projection 44 engages the keeper 34, as shown in Figs. 3, 7, 10 and 11, and locks the extension plate against closing movement. Thus, the stop 31, the engaging abutment 30, the engagement of the sliding latch 33 with the keeper 34, and the guide pin 42 in the guide 43 cooperate to hold the extension plate 17 solidly to the base plate 16, so that movement of the door is restricted to rotation about the pivot pin 26 as long as the slidable latch 33 is engaged with the keeper 34.

On closing the door, turning motion will occur about the second pivot axis only, in a clockwise direction, as viewed in Fig. 3, and the arcuate latch 35 carried thereby will move in and approach the cam surface 45 on the sliding latch 33. When chamfered portion 46 on the latch 35 strikes the cam surface 45 on the sliding latch 33, the latter is moved upwardly, and it will continue to move upwardly until the body member 41 of the sliding latch 33 rests on the upper surface of the arcuate latch 35. As the sliding latch 33 is being displaced by the latch 35, the projection 44 is moved out of engagement with the keeper 34. When the projection 44 and keeper 34 are disengaged, the sliding latch 33 and the latch 35 are

again in the position shown in Fig. 9. Further closing movement causes the latch 35 to engage the inner abutment surface 36 of the keeper 34, and thereby lock the extension plate 17 and the door plate 18 against relative movement about the second pivot axis. From this point, the door will pivot about its first pivot axis only to its closed position in the normal manner.

Referring to Figs. 14, 15 and 16, there is diagrammatically shown the three positions of the door 10 and hinge 12. Fig. 14 shows the position of the hinge when the door is closed, Fig. 15 the position of the door and hinge when the lock 32 is released or being locked, and Fig. 16 the position of the hinge 12 when the door is in its open position.

Briefly, the operation of my hinge 12 is as follows: As the door is moved from its closed position, rotation occurs about the first hinge pin 24 and the door plate 18 and extension plate 17 are locked against relative movement because of the lock 32. When the stop 31 on the extension plate strikes the portion 34 on the base plate 16, further rotation about the first hinge pin 24 stops. Continued opening motion will cause the door plate to rotate about the second hinge pin 26, at which time the sliding latch 33 will operate to cooperate with the stop 31 and keeper 34 to lock the extension plate 17 solidly with the base plate 16. From this point, the remainder of the opening motion is about the second hinge pin 26 only.

As the door is moved to its closed position, rotation occurs about the second hinge pin 26 only until the latch 35, carried by the door plate, strikes the cam 45 on the sliding latch 33 and moves the sliding latch to its disengaged position. When the sliding latch 33 is disengaged, rotation about the first hinge pin 24 only occurs, thereby causing the latch 35 to engage the keeper 34 and lock the extension plate 17 and door plate 18 against relative movement. Further motion of the door 10 will be about the first hinge pin only, until the door is fully closed.

From the foregoing description, it can be seen that I have provided an extension hinge, which is sequential in operation, and that motion about both axes simultaneously will not occur, both in the opening and closing directions. Also, the operator does not have to follow a series of motions to close the door. In fact, the operator will open and close the door in the usual manner, because the selection of the proper pivot axis will be automatic regardless of the position of the door.

Furthermore, this hinge may be made from stock material and will not require expensive field adjustments. Also, the parts have been kept to a minimum.

While I have shown my invention in several forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof.

What I claim is:

1. The combination with a hinge mechanism comprising a base plate adapted to be secured to a jamb structure, an extension plate pivoted to said base plate to rotate about a first axis, and a door plate pivoted to said extension plate to rotate about a second axis spaced from said first axis and adapted to be rigidly fastened to a door structure, of means for locking said door plate and said extension plate against relative movement about said second axis during the movement of the door structure about said first axis, and means for locking said extension plate and said base plate against relative movement about said first axis during movement of the door structure about said second axis.

2. A hinge mechanism comprising a base plate adapted to be secured to a jamb structure, an extension plate pivoted to said base plate to rotate about a first axis, a door plate pivoted to said extension plate to rotate about a second axis spaced from said axis, a releasable locking means associated with said base plate and said door plate to prevent relative movement between said extension plate and said door plate about said second axis during an initial portion of opening movement and final closing movement of said door plate, said initial opening movement and final closing movement occurring about said first axis, and latch means operative, upon release of said locking means, to prevent relative movement of said base plate and said extension plate about said first axis during the latter portion of opening movement of said door plate.

3. The combination with a hinge mechanism comprising a base plate adapted to be rigidly secured to a jamb structure, an extension plate hinged at one end to said base plate by a first hinge pin to provide a first pivot axis, and a door plate hinged to the other end of said extension plate by a second hinge pin to provide a second pivot axis, said door plate being adapted to be secured to a door structure, of a rotation-limiting mechanism comprising, a stop for limiting the rotation of said extension plate about said first pivot axis in one direction, a locking means including a stationary keeper carried by said base plate and a latch carried by said door plate, said latch cooperating with said keeper to prevent relative movement between said extension plate and said door plate about the second pivot axis while said extension plate is moving relative to said base plate, and a sliding latch member mounted for axial movement relative to said first hinge pin and responsive to the position of the latch carried by said door plate, for engaging said keeper to prevent movement between said base plate and said extension plate in the other direction, while said door plate is moving relative to said extension plate about said second axis.

4. The combination with a hinge mechanism comprising a base plate adapted to be rigidly secured to a jamb structure, an extension plate hinged at one end to said base plate by a first hinge pin to provide a first pivot axis, and a door plate hinged to the other end of said extension plate by a second hinge pin to provide a second pivot axis, said door plate being adapted to be secured to a door structure, of a rotation-limiting mechanism comprising, a stop carried by said extension plate for abutting said base plate and limiting the outward rotation of the extension plate about said first pivot axis, a lock including a stationary keeper carried by said base plate adjacent said first hinge pin and a latch carried by said door plate, said latch and said keeper cooperating to lock said extension plate and said door plate against relative movement about said second pivot axis during the initial opening motion and the final closing motion of the door plate and while motion of the extension plate occurs about said first pivot axis, and said latch and said keeper being adapted to be disengaged when said stop abuts said base plate, and a sliding latch mounted for axial movement relative to said first hinge pin and responsive, when said door plate is moved in the opening direction after said stop has been engaged and said lock

has been released, to engage said keeper, said sliding latch cooperating with said stop for preventing relative motion of said extension plate about said first pivot axis in either direction.

5. The combination with a hinge mechanism comprising a base plate adapted to be rigidly secured to a jamb structure, an extension plate hinged at one end to said base plate by a first hinge pin to provide a first pivot axis, and a door plate hinged to the other end of said extension plate by a second hinge pin to provide a second pivot axis, said door plate being adapted to be secured to a door structure, of a motion-limiting mechanism comprising, a stop carried by said extension plate and adapted to abut said base plate for limiting the outward rotation of said extension plate about said first pivot axis, a lock including a stationary keeper carried by said base plate and disposed adjacent said first hinge pin and a latch carried by said door plate, said latch and said keeper, when the door is closed, being in overlapping relation and cooperating to lock said door plate and said extension plate against relative motion during the initial opening movement and the final closing movement of the door plate while said extension plate rotates about said first pivot axis, and said latch and said keeper being adapted to be disengaged when said stop on said extension plate abuts said base plate, and a biased sliding latch having a disengaged and an engaged position, said sliding

latch being mounted for axial movement relative to said first hinge pin, and held in its disengaged position by the latch carried by said door plate, said sliding latch having a projecting portion for engaging said keeper and locking said extension plate against closing movement with respect to said base plate when said stop on said extension plate abuts said door plate and the latch carried by said door plate is released by said keeper and moves therefrom, a pin carried by said sliding latch and guided by said extension plate for rotation therewith about said first axis, for preventing rotation of said sliding latch when engaged by said keeper, and said sliding latch also including a cam surface adapted, when said door is moved in a closing direction a predetermined extent, to be engaged by the latch carried by the door plate, to move the sliding latch to its disengaged position, to permit rotation about said first hinge pin and subsequent locking of said door plate and said extension plate.

FREDERICK L. TALCOTT, JR.

REFERENCES CITED

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

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Number	Country	Date
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