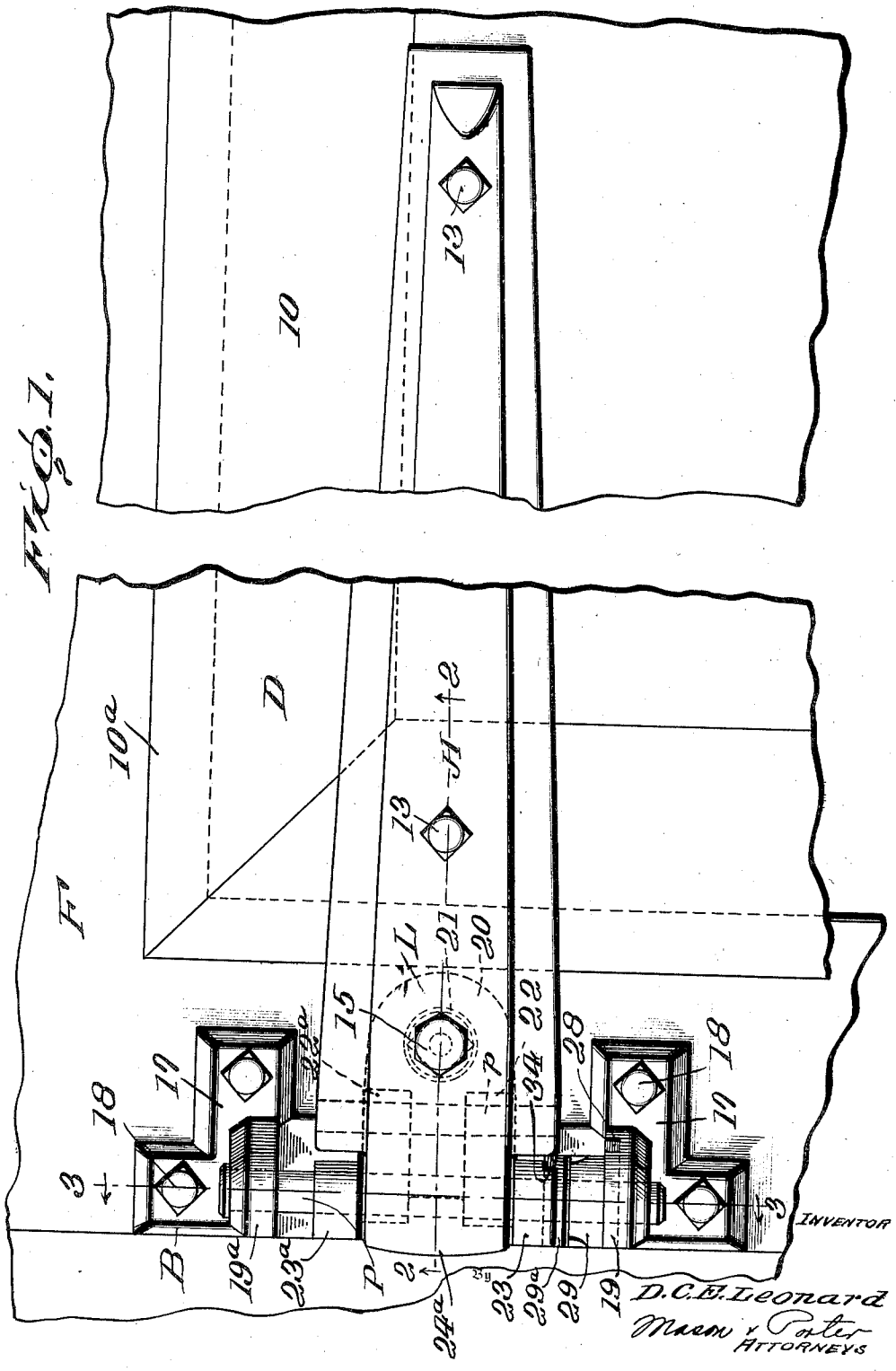
July 16, 1940. D. C. E. LEONARD 2,208,310

HINGE FOR DOORS

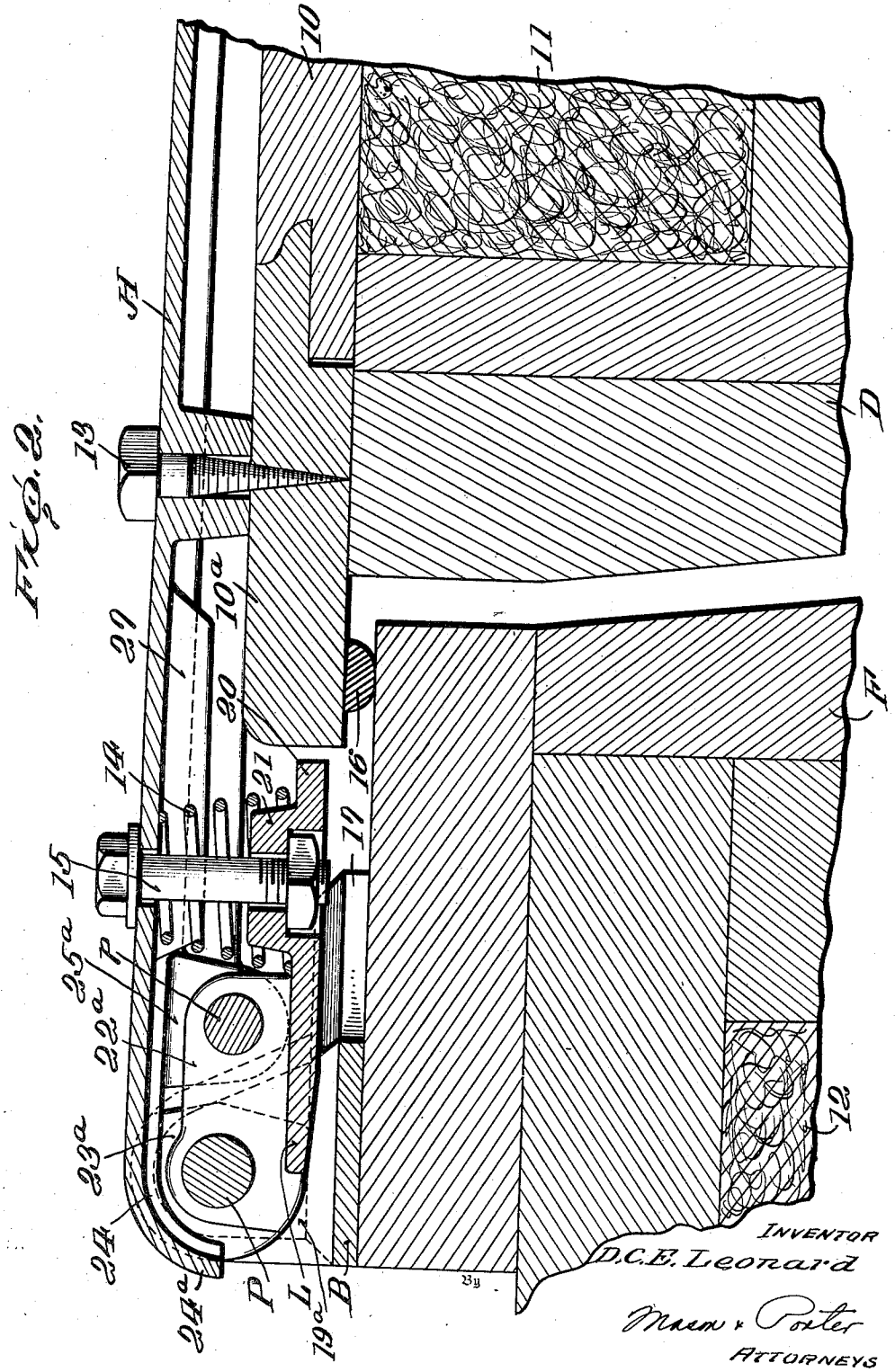
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HINGE FOR DOORS

Filed May 29, 1939 4 Sheets-Sheet 2



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HINGE FOR DOORS

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FIG. 3.

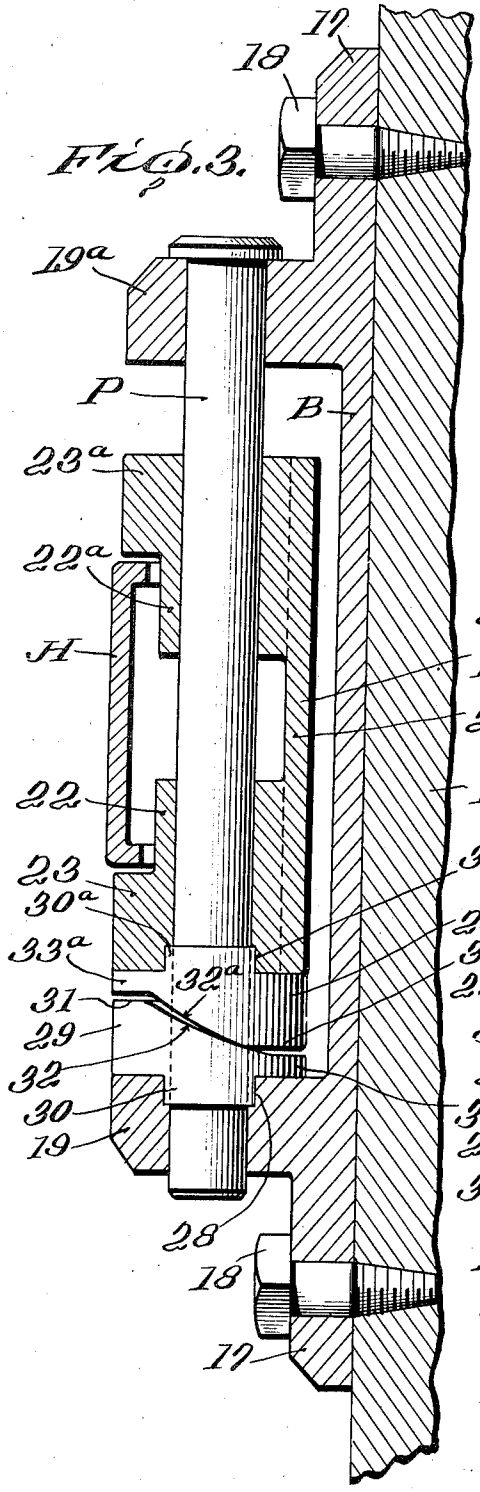
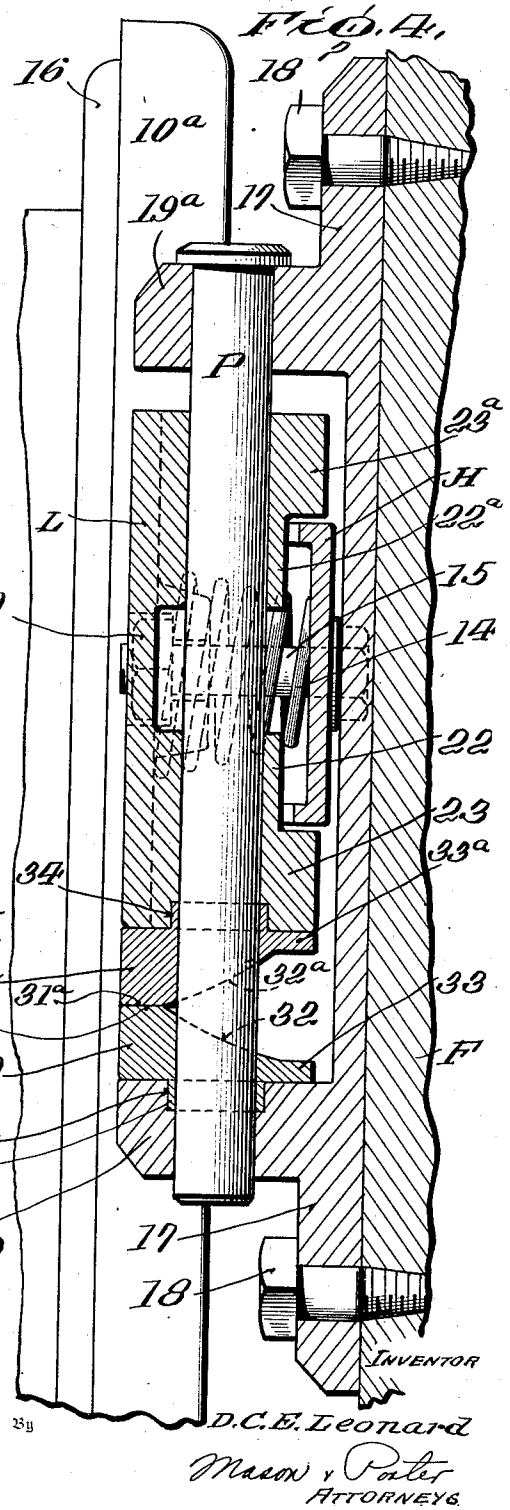


FIG. 4.



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HINGE FOR DOORS

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FIG. 5.

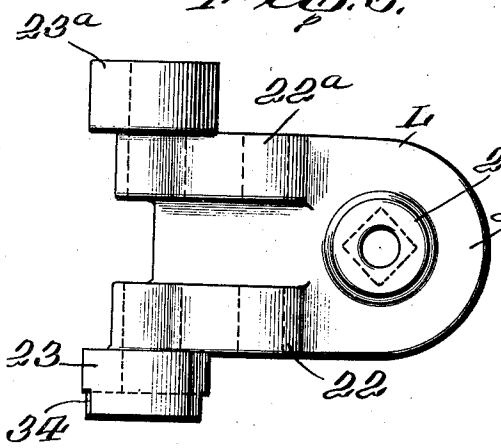


FIG. 7.

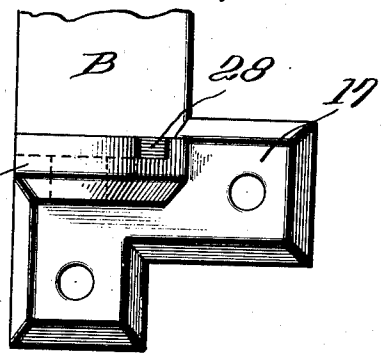


FIG. 6.

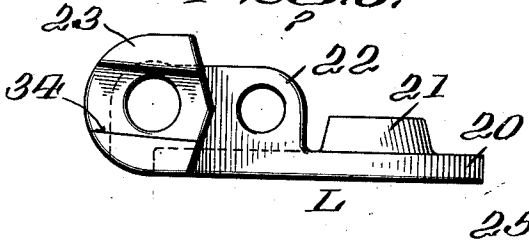


FIG. 8.

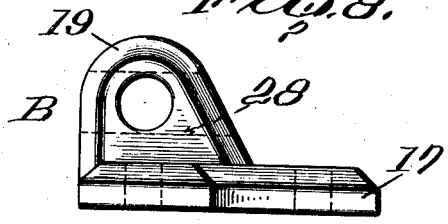


FIG. 9.

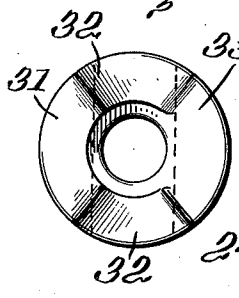


FIG. 11.

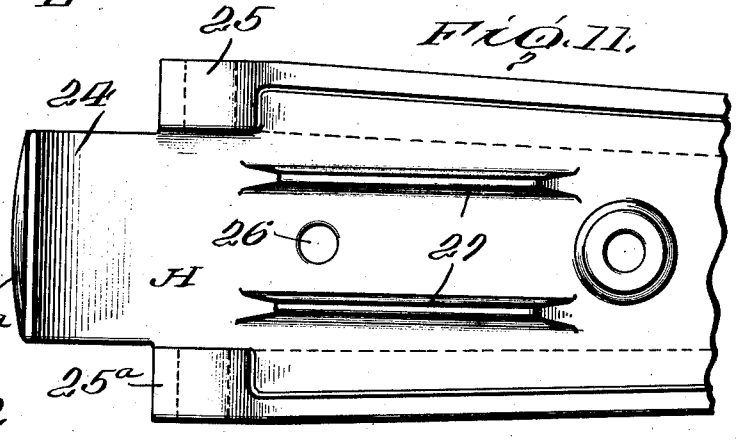


FIG. 10.

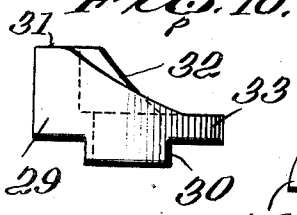
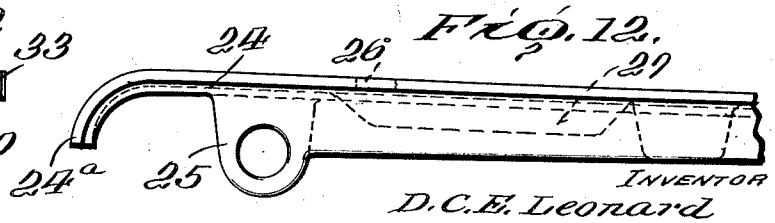


FIG. 12.



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UNITED STATES PATENT OFFICE

2,208,310

HINGE FOR DOORS

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Application May 29, 1939, Serial No. 276,482

11 Claims. (Cl. 16—153)

The present invention relates to new and useful improvements in a door mounting, and more particularly to improvements in a hinge assembly for a door which is adapted to make tight sealing contact with the door frame entirely around the door opening therethrough.

A door of this type is generally employed for closing an opening to a chamber which is to be maintained at a temperature different from normal atmospheric temperature, such as for instance, a cold storage or refrigerator chamber, a heated chamber, or even a chamber which is to be maintained at a moderate variation in pressure. The door may be of any suitable type, as for instance, an interfitting or overlapping type, for closing the opening in the door frame and sealing strips or gaskets are provided for compression between the door frame and the door whereby to establish a tight seal when the door is closed. The door is hingedly mounted on the door frame for swinging movement. Although the door may be used in various instances, as pointed out above, the invention is particularly concerned with the provision of a hinge assembly for use on refrigerator doors of the type which swing about vertically disposed hinges.

An object of the invention is to provide a door hinge assembly which permits the door to make tight sealing contact with the door frame even when an obstruction, such as ice, forms on the line of contact between the door frame and the door.

A further object of the invention is to provide a hinge assembly of the above type which is adapted to compensate for wear on the sealing strip or gasket so that the door will make continuous tight sealing contact with the door frame.

A still further object of the invention is to provide a hinge assembly of the above type wherein cooperating parts of the hinge assembly are normally separated by spring means which permits relative movement between these parts so as to effect a tight seal between the door and the door frame.

A still further object of the invention is to provide a hinge assembly of the above type wherein the spring means is disposed at right angles to the plane of the door and wherein the spring means can be adjusted to compensate for wear of the sealing gasket between the door frame and the door.

The invention still further aims to provide a hinge assembly of the above type which includes cam means for elevating the door at least during its initial opening movement, the cam means being constructed so that it will normally effect final closing of the door and so that the weight of the door normally tends to effect a tight seal between the door and the door frame when the door is in a position for closing the door opening.

The above and other objects of the invention will in part be obvious and will be hereinafter more fully pointed out.

In the accompanying drawings,

Figure 1 is a fragmentary side elevation showing the hinge assembly with the door closed against the door frame.

Figure 2 is an enlarged sectional view taken along the line 2—2 of Figure 1.

Figure 3 is an enlarged sectional view taken along the line 3—3 of Figure 1.

Figure 4 is a sectional view, similar to Figure 3, but showing the hinge assembly with the door in an open position.

Figure 5 is a top plan view of the hinge link which is pivotally mounted on the door frame.

Figure 6 is a side elevation of Figure 5 showing the position of the cam receiving slot in the hinge link.

Figure 7 is a fragmentary top plan view of the bracket which is secured to the door frame.

Figure 8 is a side elevation of Figure 7.

Figure 9 is a top plan view of the lower cam member.

Figure 10 is a side elevation of Figure 9.

Figure 11 is a bottom plan view of one end of the hinge member which is secured to the door.

Figure 12 is a side elevation of Figure 11.

Referring more in detail to the accompanying drawings, one form of the invention is shown for purposes of illustration and the refrigerator door D is illustrated as being of the type which fits within the door opening defined by the door frame F. The door includes a front panel 10 which is provided with a laterally extending peripheral flange 10*a* which is adapted to overlie the edge of the door frame. The door is of the type which includes a suitable insulating material 11 and similarly, the wall around the frame F is of the type which includes a suitable form of insulating material 12. A hinge member H is secured to the front panel 10 of the door by means of screws 13 or the like. One end of the hinge member extends laterally beyond the edge 10*a* of the front panel 10. A hinge link L has one end thereof pivotally mounted on a pivot bolt P which is carried by a supporting bracket B secured to the door frame. The hinge link L is also pivotally connected intermediate the ends thereof with the hinge member H by means of

a floating pivot pin *p* which is disposed within the extended end of the hinge member H. A coil spring 14 is disposed between the opposite end of the hinge link L and the hinge member H for normally separating the same. An adjustable bolt 15 extends through the hinge member H, the coil spring 14, and the hinge link L. A sealing gasket 16 is disposed between the flange 10*a* on the door D and the edge of the door frame F. This sealing gasket is adapted to be compressed between the overlying edge 10*a* of the door and the door frame when the door is closed for effecting a tight seal. It is obvious that the sealing gasket 16 may be carried either by the door or by the frame.

The supporting bracket B includes a base portion having extended portions 17 which are secured to the frame F by bolts 18 or the like. The extended portions 17 are spaced from one another a distance greater than the width of the hinge member H and, in the region of these extended portions, the supporting bracket B is provided with spaced parallel upstanding lugs 19, 19*a* which are apertured to receive the pivot bolt P.

The hinge link L includes a body portion 20 which is provided at one end thereof with an upstanding apertured boss 21 through which the bolt 15 extends and around which one end of the coil spring 14 is disposed. The body portion 20 of the hinge link is provided over a substantial portion thereof with spaced upstanding longitudinally extending ribs 22, 22*a* which are apertured at the inner ends thereof to receive the pivot pin *p*. The outer or opposite ends of the ribs 22, 22*a* are apertured to receive the pivot bolt P and these apertures are in alignment with outwardly offset apertured lugs 23, 23*a* which are formed integrally with the body portion 20 of the hinge link. When the door is closed, the lugs 23, 23*a* on the hinge link are each spaced inwardly from the lugs 19, 19*a* on the supporting bracket B.

The hinge member H is, as pointed out above, secured to the door D, but one end thereof is extended laterally of the door. This extended end of the hinge member is provided with a tongue portion 24 which is disposed within the lugs 23, 23*a* on the hinge link, and the end of this tongue portion is curved toward the supporting bracket, as at 24*a*, to overlie the pivot bolt P. Within the free end of the tongue portion 24, the hinge member is provided with depending lugs 25, 25*a* which are positioned so as to be disposed outside of the inner ends of the ribs 22, 22*a* on the hinge link. These lugs 25, 25*a* are provided with apertures in alignment with the apertured inner ends of the ribs 22, 22*a* so that the pivot pin *p* extends therethrough. The hinge member is provided with an aperture 26 through which the bolt 15 extends and also with strengthening ribs 27.

The lower lug 19 on the supporting bracket B is provided in the upper face thereof with a slot 28 extending parallel to the door frame. A cam member 29 is provided with a depending rib 30 which is adapted to fit snugly within the slot 28 in the lug 19 on the supporting bracket and to be mounted in this position. This cam member is apertured so that the pivot bolt P will extend therethrough and is provided with an elevated portion 31 which merges into a lower portion 33 through two inclined convex cam surfaces 32.

The lower outwardly offset lug 23 on the hinge link L is provided in the under face thereof with a slot 34 which is inclined with respect to the plane of the body portion 20 of the hinge link and is inclined downwardly toward the boss 21. Thus, the slot 34 is inclined with respect to the slot 28 in the lug 19. There is provided an additional cam member 29*a* which is similar to the cam member 29. This cam member 29*a* is provided with an upstanding rib 30*a* which is adapted to fit snugly within the slot 34 in the lug 23 on the hinge link. Thus, the cam member 29*a* is reversed with respect to the cam member 29. The cam member 29*a* is provided with an elevated portion 31*a* and with a lower portion 33*a* which merge together through two inclined concave surfaces 32*a*. The cam members 29, 29*a* are thus shaped so that in one position they will exactly coincide and interfit with one another. The inclination of the slot 34 in the lug 23 is for the purpose of fitting the cam member 29*a* with respect to the cam member 29 so that the weight of the door acting downwardly on the cam members tends to normally tightly compress the sealing gasket 16 between the door and the door frame when the door is closed in a manner to be hereinafter more fully pointed out.

From the foregoing description it will be seen that the door is mounted for normal pivotal swinging movement on the pivot bolt P. Thus, the hinge link L is pivotally mounted on the bolt P and the hinge member H is pivotally connected to the link L intermediate the ends thereof by means of the pivot pin *p*. The bolt 15 connects the hinge member H and the link L and limits movement of these parts away from one another. The coil spring 14 acts at substantially right angles to the plane of the door D and, under normal operation, limits movement of the hinge member H and the link L toward one other. Under normal operation, therefore, the door and hinge assembly swings about the pivot bolt P.

When the door is closed, as shown in Figures 1, 2 and 3, the sealing gasket 16 is compressed between the edge 10*a* of the door and the door frame so as to effect a tight seal around the door opening. In this closed position of the door, the cam members 29, 29*a* do not exactly coincide in interfitting relationship. As shown in Figure 6, the slot 34 in which the upper and downwardly facing cam 29*a* is mounted, is inclined slightly so that it is not in exact alignment with the slot 28 in the lug 19 on the supporting bracket. Thus, when the door is closed, the elevated face 31 on the cam 29 is spaced from the lower portion 33*a* on the cam 29*a* and similarly, the lower portion 33 on the cam 29 is spaced from the elevated portion 31*a* on the cam 29*a*. In this position of the cam members the inclined surfaces 32, 32*a* are in engagement so that the weight of the door acting downwardly tends to cause rotation of the door with the cam 29*a* toward a position in which it would coincide exactly with the cam 29. Thus, the weight of the door acting on the cam members, even when closed, constantly tends to more tightly shut the door so as to compress the sealing gasket and effect a tight seal around the door opening.

In opening the door, initial movement thereof will cause the cam 29*a* to ride up the inclined surface 32 on the cam 29 so that the entire door is elevated the distance between the lower portion 33 and the elevated portion 31 on the cam 29. For this purpose, the apertured lug 23*a* on the hinge link is spaced a sufficient distance from the upper lug 19*a* on the supporting

bracket B. This is clearly shown in Figure 3. In Figure 4, the position of the various parts of the hinge assembly is shown when the door is open. Thus, the elevated surfaces **31**, **31***a* of the cams **29**, **29***a*, respectively, are in engagement and the lower surfaces **33**, **33***a* are widely separated so that the entire door is elevated during its opening movement in order to clear a sill or to break any ice formations which may have formed while the door was closed. The elevation of the door by the cam means may continue during opening of the door for approximately 75 degrees, after which the door remains in this elevated position through the rest of its swinging movement.

In closing the door, the hinge parts will assume the position of Figure 3. However, obstructions, such as ice formations, often occur around the door frame. Thus, if obstructions form so as to limit closing movement of the edge of the door adjacent the hinge mounting therefor, the opposite edge of the door will not normally shut tightly. In order to overcome this difficulty, the present invention provides a hinge construction wherein the remote edge of the door can be moved to a tightly closed position. This movement of the door is permitted by a slight relative movement of the hinge member H about the pivot pin *p* and against the action of the coil spring **14**. Thus, relative movement between the hinge link L and the hinge member H is permitted by the spring for this purpose. Similarly, if the gasket **16** at the edge adjacent the hinge mounting for the door becomes worn so that a tight seal is not normally effected at this point, the bolt **15** can be adjusted so as to permit a slight separation between the hinge member H and the hinge link L. This permits the floating pin *p* to be shifted inwardly a slight distance to permit the door to make tight sealing engagement with the door frame.

It will be seen from the foregoing description that the present invention provides a hinge construction which permits the door to make tight sealing contact with the door frame entirely around the door opening under all circumstances. To this end, the hinge assembly includes a plurality of parts which may be shifted relative to one another for the above purposes. Furthermore, the cam means for elevating the door, when it is being opened, is constructed so that the weight of the door tends to maintain the same closed and tightly sealed against the door frame. Thus, the cam members are arranged so that when the door is moved toward a closed position the cam members cooperate to urge the door to its finally closed position, thus, obviating the necessity of pushing or pulling the door to a tightly closed position.

While one form of the invention has been shown for purposes of illustration, it is to be clearly understood that various changes in the details of construction and arrangement of parts may be made without departing from the scope of the invention as set forth in the appended claims.

I claim:

1. A hinge for doors adapted to close and seal an opening through a door frame, comprising a bracket secured to the door frame, a hinge member secured to the door, a link pivoted at one end to said bracket and pivotally connected intermediate the ends thereof to said hinge member for supporting the door, and spring means interposed between the opposite end of said link and said hinge member for normally separating the same.

2. A hinge for doors adapted to close and seal an opening through a door frame, comprising a bracket secured to the door frame, a hinge member secured to the door, a link pivotally connected at one end thereof to said bracket and pivotally connected intermediate the ends thereof to said hinge member for supporting the door, and spring means disposed between the opposite end of said link and said hinge member and extending at right angles to the plane of the door for normally separating said hinge member and the said opposite end of said link.

3. A hinge for doors adapted to close and seal an opening through a door frame, comprising a bracket secured to the door frame, a hinge member secured to the door, a link pivotally connected at one end thereof to said bracket and pivotally connected intermediate the ends thereof to said hinge member for supporting the door, spring means for normally separating said hinge member and the opposite end of said link, and cam means associated with said link and with said bracket for utilizing the weight of the door to maintain a tight seal between the door frame and the door when the door opening is closed.

4. A hinge for doors adapted to close and seal an opening through a door frame, comprising a bracket secured to the door frame, a hinge member secured to the door, a link pivotally connected at one end thereof to said bracket and pivotally connected intermediate the ends thereof to said hinge member for supporting the door, spring means for normally separating said hinge member and the opposite end of said link, and cam means associated with said link and with said bracket for effecting a slight elevation of the door when opened.

5. A hinge for doors adapted to close and seal an opening through a door frame, comprising a bracket secured to the door frame and having a cam surface thereon, a hinge member secured to the door, a link pivotally connected at one end thereof to said bracket and pivotally connected intermediate the ends thereof to said hinge member for supporting the door, spring means for normally separating said hinge member and the opposite end of said link, and a cam member associated with said link and movable therewith for cooperation with the cam surface on said bracket, said cam member and said cam surface being disposed relative to one another for causing the weight of the door when closed to maintain the door tightly sealed against the door frame.

6. A hinge for doors adapted to close and seal an opening through a door frame, comprising a bracket secured to the door frame, a hinge member secured to the door and having an apertured lug disposed outside of the edge of the door, a hinge link pivotally connected at one end thereof to said bracket and having an upstanding portion provided with an aperture in alignment with the aperture in said lug, a pivot pin connecting said upstanding portion with said lug, and spring means disposed between the opposite end of said hinge link and said hinge member for normally separating the same and for permitting relative movement therebetween whereby the door will make tight sealing contact with the door frame.

7. A hinge for doors adapted to seal and close an opening in a door frame, comprising a bracket secured to the door frame, a hinge member se-

cured to the door and having an apertured lug disposed outside of the edge of the door, a hinge link pivotally connected intermediate the ends thereof to said lug and having one end thereof pivotally connected to said bracket, a coil spring between the opposite end of said link and said hinge member and disposed at substantially right angles to the plane of the door for normally separating the said opposite end of said link and said hinge member, and a bolt extending through said coil spring for limiting separation of said hinge member and said link, said bolt being adjustable to permit further separation of said hinge member and said link whereby to compensate for wear between the adjacent edges of the door and the door frame.

8. A hinge for doors adapted to close and seal an opening through a door frame, comprising a bracket secured to the door frame, a hinge member secured to the door and extending laterally beyond the edge thereof, a hinge link having an upstanding rib provided with a pair of apertures spaced longitudinally thereof, an outwardly offset lug on said link provided with an aperture in line with the aperture at one end of said rib, a pivot bolt secured to said bracket and extending through the aligned apertures in said lug and said rib, a floating pivot pin extending through the aperture at the opposite end of said rib and connected to said hinge member, a coil spring disposed between the opposite end of said link and said hinge member for normally separating the same, and a bolt extending through said coil spring for limiting separation of said hinge member and said link, said bolt being adjustable for permitting further separation of said hinge member and said link to compensate for wear between the adjacent edges of the door and the door frame.

9. A hinge for doors adapted to close and seal an opening in a door frame, comprising a bracket secured to the door frame and having an outwardly extending lug, a stationary cam surface carried by said lug, a hinge member secured to the door, a hinge link pivotally connected intermediate the ends thereof to said hinge member and pivotally connected at one end thereof to said bracket, and a cam member movable with said hinge link upon opening and closing of the door and cooperating with said cam surface for effecting elevation of the door when opened, said cam member and said cam surface being disposed relative to one another so that the weight of the door when closed is utilized to force the door into tight sealing contact with the door frame.

10. A hinge for doors adapted to close and seal an opening in a door frame, comprising a bracket secured to the door frame and having an outwardly extending apertured lug, a pivot bolt extending vertically through said lug, means providing a stationary cam surface on said lug, a hinge member secured to the door, a hinge link pivotally connected intermediate the ends thereof with said hinge member and pivotally connected at one end thereof to said bolt, and a cam member movable with said hinge link upon opening and closing of the door and cooperating with said cam surface for effecting elevation of the door when opened, said cam member and said cam surface being disposed relative to one another so that the weight of the door when closed is utilized to force the door into tight sealing contact with the door frame.

11. A hinge for doors adapted to close and seal an opening in a door frame, comprising a bracket secured to the door frame and having an outwardly extending lug provided with a slot parallel to the door frame, a cam member having a depending rib fitting within the slot in said lug, a hinge member secured to the door, a hinge link pivotally connected intermediate the ends thereof to said hinge member and pivotally connected at one end thereof to said bracket, said hinge link having an offset lug disposed above the lug on said bracket and provided with a slot inclined with respect to the slot in the lug on said bracket, and a movable cam member having a rib fitting within the slot in the lug on said hinge link and movable with said hinge link upon opening and closing of the door for cooperation with the cam member on the bracket for effecting elevation of the door when opened, the inclined cam receiving slot in the lug on said hinge link serving to position the cam members relative to one another so that the weight of the door when closed is utilized to force the door into tight sealing contact with the door frame.

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