

May 7, 1957

C. E. CAMPBELL
HINGE CONSTRUCTION

2,790,992

Filed Aug. 11, 1954

3 Sheets-Sheet 1

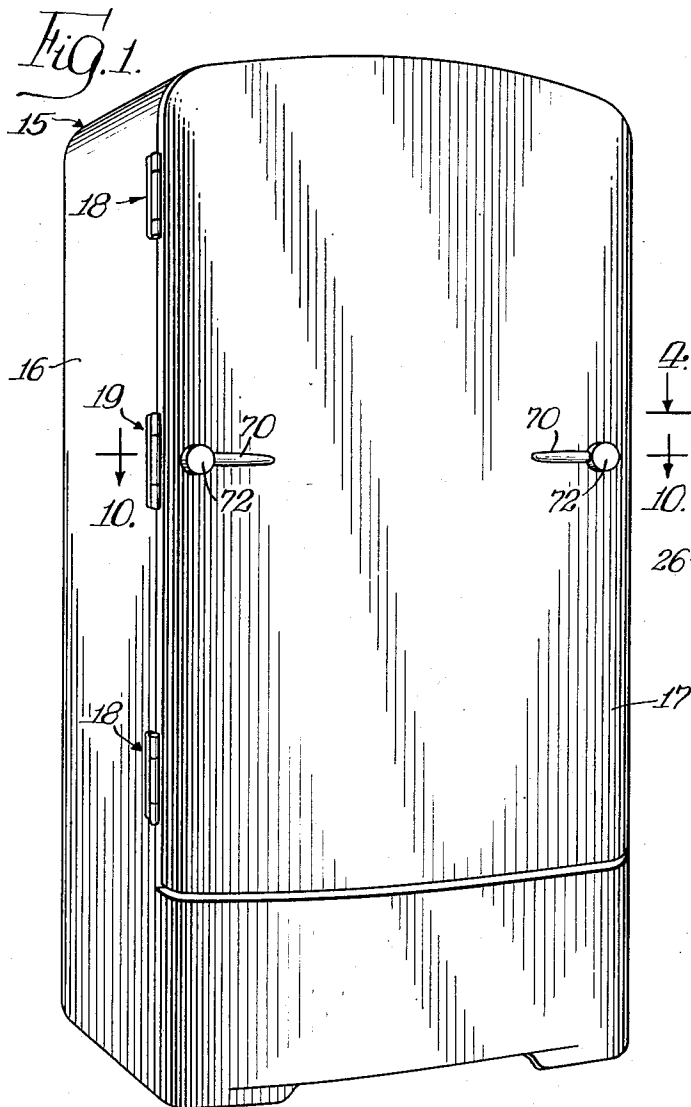
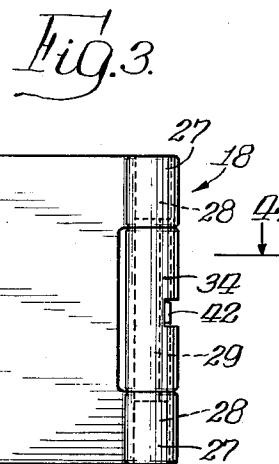
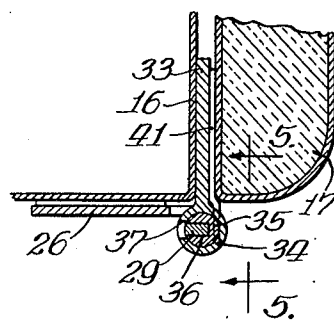
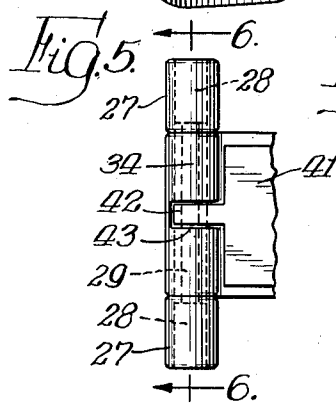
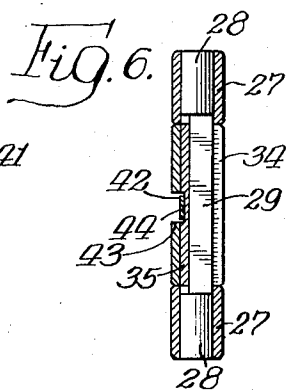


Fig. 4.



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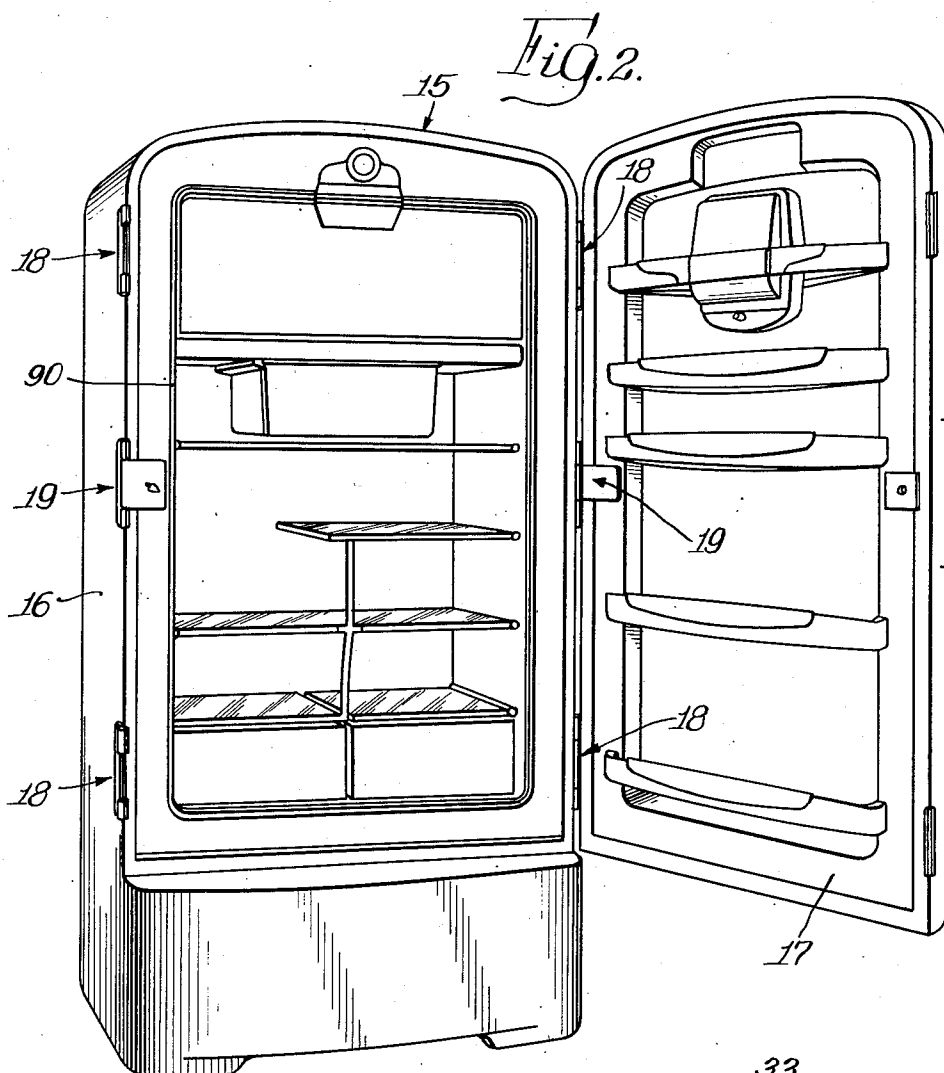
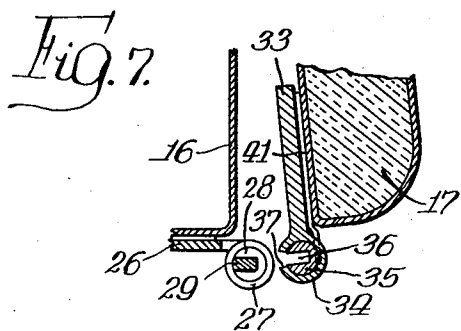
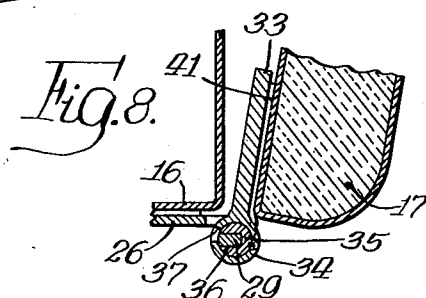
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3 Sheets-Sheet 2



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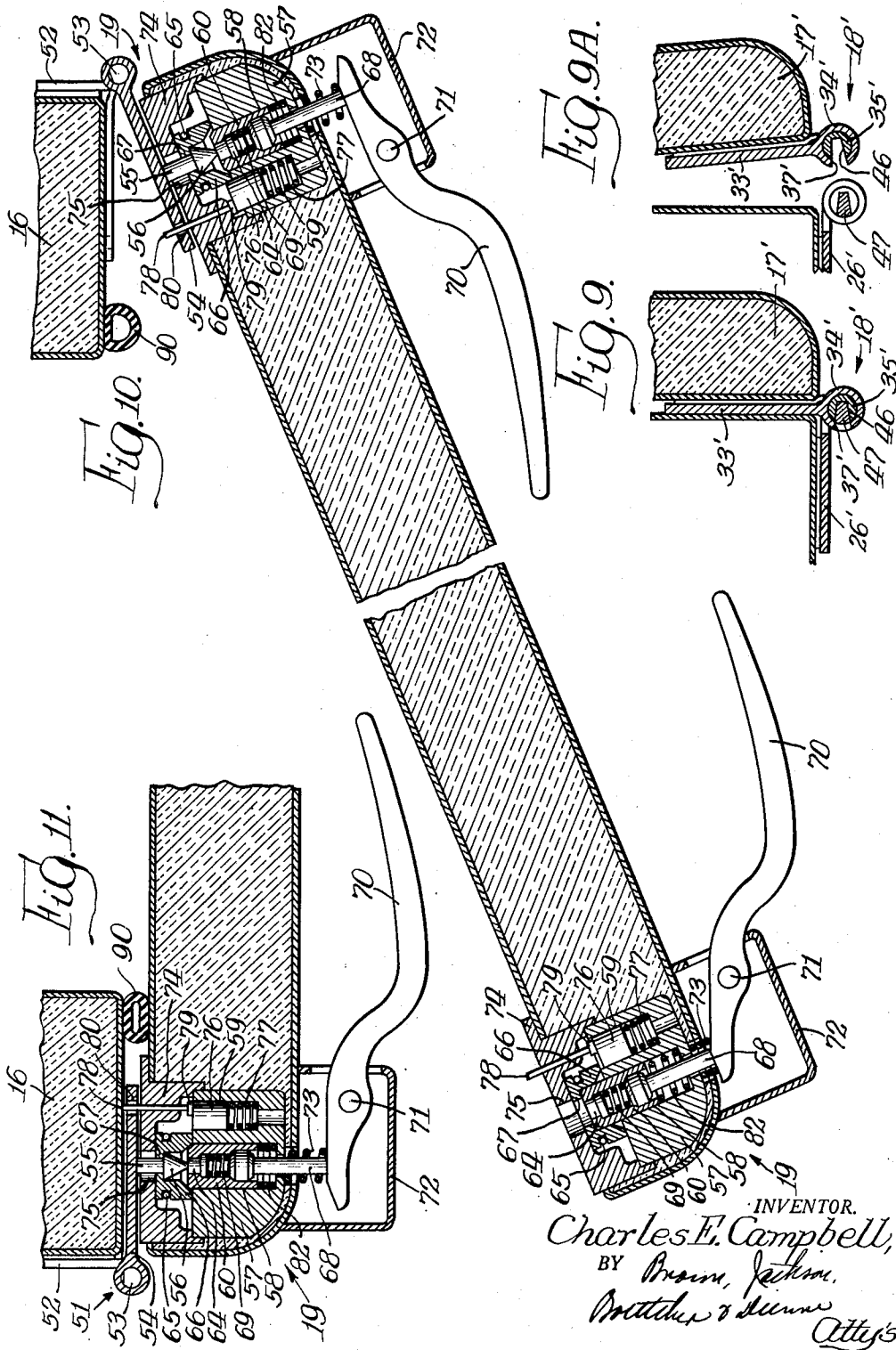
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HINGE CONSTRUCTION

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3 Sheets-Sheet 3



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2,790,992

HINGE CONSTRUCTION

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Application August 11, 1954, Serial No. 449,111

9 Claims. (Cl. 16—171)

My present invention relates generally to hinge constructions, and, more specifically, is directed to disconnectable hinge constructions adapted for use, for example, in hinging the doors of refrigerators, cabinets, and the like, whereby the doors may be swung open from either side.

The modern domestic refrigerator, with its many features and conveniences, is deficient in one respect. The door can only be swung open from one side. This renders the refrigerator functionally unsuited for use in modern kitchens wherein work tables are arranged at each side of the refrigerator. Access may be conveniently had to a conventional refrigerator, in the circumstances noted, where the user thereof is working on the work table adjacent the side of the refrigerator at which the door opens. However, it will be appreciated that if the user of the refrigerator is working on the work table adjacent the side of the refrigerator at which the door is hinged, many useless steps must be taken by the user in walking around the door to gain access to the refrigerator after the door has been opened.

Another disadvantage of the conventional refrigerator should be noted at this point. When a refrigerator is purchased for use in a kitchen having limited space, the user of the refrigerator is generally careful to purchase one having a door which opens on the side most convenient for the user in his particular kitchen. Now, if, subsequent to the purchase of the refrigerator, the furniture of the kitchen should be rearranged, or if the user should move to a new location, it frequently happens that for the new use the door of the refrigerator is hinged on the wrong side, thus making access to the refrigerator inconvenient.

It is an object of my present invention to provide disconnectable hinge constructions particularly adapted for mounting refrigerator doors wherein the latter may be selectively swung open from either side.

It is a further object of my present invention to provide a hinge construction of the character noted, which comprises a first hinge member having a first hinge element non-rotatable relative thereto, and a second hinge member having a second hinge element revolvably mounted therein, which first and second hinge elements may be moved into cooperating position on a hinge axis.

It is a still further object of my present invention to provide the first hinge element with an intermediate non-circular portion adapted to be received in a slot formed in the second hinge element, whereby an interlock is effected after the first and second hinge elements have been disposed in engagement and upon initial pivotal movement of the second hinge member relative to the first hinge member.

It is another object of my present invention to provide hinge constructions having component parts which may be fabricated from stampings and the like, to maintain the cost of manufacture at a minimum.

In addition to the provision of the above noted hinge

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constructions at each side of a refrigerator door, it is necessary to provide suitable latch means at each side of the door to prevent disengagement of the hinge elements of the disconnectable hinge constructions, unless desired. Each latch means which I employ in my present invention comprises a plate which is hinged to the frame of the refrigerator and a lock pin secured to the plate. Expansible collar means is carried by the refrigerator door for engaging the lock pin, and a suitable plunger is provided for expanding the collar means to thereby effect disengagement of the latter from the lock pin to permit the door to be disengaged from the plate. Also, suitable means is provided for preventing disengagement of the collar means from the lock pin after the plate and door have been swung away from the frame about the hinged axis of the plate. It is to be observed that when the collar means of the latch means at one side of the door is disengaged from the adjacent lock pin, disengagement of the collar means of the latch means at the other side of the door from the adjacent lock pin is prevented. Thus, the door may be opened at only one side at a time.

Now, in order to acquaint those skilled in the art with the manner of constructing and using hinges in accordance with the principles of my present invention, I shall describe, in connection with the accompanying drawings, preferred embodiments of my present invention.

In the drawings:

Figure 1 is a perspective view of a refrigerator with which the hinge constructions of my present invention are embodied, the refrigerator door being shown closed;

Figure 2 is a perspective view of the refrigerator of Figure 1 showing the refrigerator door in an open position;

Figure 3 is a side elevational view of one embodiment of disconnectable hinge construction of my present invention;

Figure 4 is a horizontal sectional view of the hinge construction of Figure 3, taken along the line 4—4, looking in the direction indicated by the arrows, and includes a fragmentary showing of a refrigerator door;

Figure 5 is a fragmentary elevational view of the hinge construction of Figure 4, taken substantially along the line 5—5, looking in the direction indicated by the arrows;

Figure 6 is a partial vertical sectional view of the hinge construction of Figure 5, taken along the line 6—6, looking in the direction indicated by the arrows;

Figure 7 is a horizontal sectional view showing the hinge elements disconnected from the co-engaged position shown in Figure 4;

Figure 8 is a horizontal sectional view showing the hinge elements interlocked and the movable hinge member pivoted from the position shown in Figure 4;

Figure 9 is a horizontal sectional view of a modified form of hinge construction of my present invention showing the hinge elements in a co-engaged position;

Figure 9A is a horizontal sectional view of the modified form of hinge construction of Figure 9 showing the hinge elements in a disconnected position;

Figure 10 is a horizontal sectional view taken substantially along the line 10—10 in Figure 1, looking in the direction indicated by the arrows, and shows the latch mechanisms of my present invention incorporated in the refrigerator door which is open at one side; and

Figure 11 is a fragmentary horizontal sectional view of one side of the refrigerator door of Figure 10 in a closed position, and includes a showing of the adjacent latch mechanism.

Referring now to Figures 1 and 2, there is indicated generally by the reference numeral 15 a refrigerator comprising a body portion 16 and a door 17. Hinge constructions, indicated generally by the reference nu-

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merals 18, are disposed at each side of the refrigerator door 17, adjacent the upper and lower ends thereof. Latch means, indicated generally by the reference numerals 19, are provided at each side of the refrigerator door 17, intermediate of the ends thereof.

Referring now to Figures 3 through 8, I shall describe in detail one embodiment of hinge construction of my present invention. Each of the hinge constructions 18 comprises a vertical plate member 26, which is suitably secured to the outer side of the refrigerator body 16. The forward end of the plate 26 is provided with leg portions 27, at the upper and lower ends thereof, which leg portions 27 are formed, molded or extruded, to define generally cylindrical tubes or sleeves, the axes of which are aligned in a vertical direction.

The tubular portions of the hinge plate 26, which are defined by the sleeves 27, receive the cylindrical ends of a vertical hinge element 28 which has an intermediate rectangular portion 29. The hinge element 28 is fixed against rotation, in any suitable manner, relative to the hinge plate 26.

The hinge construction 18 further comprises a vertical hinge member 33, which is suitably secured to the refrigerator door 17 along the inner surface thereof. The outer end of the hinge member 33 is formed with a cylindrical tubular portion or sleeve 34, the length of which is substantially the same as the distance between the sleeves 27 of the hinge member 26. A vertical slot 37 is formed through the wall of the tubular portion or sleeve 34, the slot 37 being of a slightly greater width than the intermediate rectangular portion 29 of the hinge element 28.

Revolvably mounted or journaled within the tubular portion or sleeve 34 of the hinge member 33 is a hinge element or bushing cylinder 35, which has formed therein a rectangular slot 36 conformably shaped to receive the rectangular intermediate portion 29 of the hinge element 28.

Interposed between the hinge member 33 and the refrigerator door 17 is a vertical leaf spring member 41 having a finger portion 42, which extends through an opening 43 formed in the sleeve 34 of the hinge member 33. The finger portion 42 of the spring 41 engages a flattened portion 44 formed in the periphery of the bushing 35. Engagement of the finger portion 42 with the flattened portion 44 tends to normally maintain the slot 36 in the bushing 35 aligned with the slot 37 formed in the sleeve 34 of the hinge member 33. The finger portion 42 also normally retains the hinge bushing 35 against vertical movement.

The operation of the disconnectable hinge construction of my present invention is as follows. Since the hinge constructions provided at each side of the refrigerator door operate in the same manner, the operation of only one will now be described in detail. Assuming that the elements of the hinge construction 18 are in a disconnected position, as shown, for example, in Figure 7, engagement of the hinge elements is effected by moving the refrigerator door 17 toward the refrigerator body 16. During such movement of the refrigerator door 17 toward the refrigerator body 16, the intermediate rectangular portion 29 of hinge element 28 passes through the slot 37 in the sleeve 34 of the hinge member 33 into co-engagement with the rectangular slot 36 in the bushing 35. This position of the hinge elements is shown in Figure 4.

Now, assuming that the refrigerator door 17 is to be swung open from the side opposite that of the hinge construction 18 shown in Figure 4, it may be seen, as shown in Figure 8, that the slot 37 in the sleeve 34 of the hinge member 33 is rotated out of alignment with the slot 36 in the bushing 35. In this position of the hinge member 33, the wall of the sleeve 34 engages the rear edge of the rectangular portion 29 of the hinge element 28, thereby preventing the latter from being withdrawn from the slot 36 in the bushing 35. It will thus be readily apparent that, upon initial pivotal movement of the hinge member

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33 relative to the hinge member 26, the rectangular portion 29 of the bushing 28 is interlocked with the slot 36 in the hinge element 35, thereby providing a hinge which cannot be disconnected. In other words, when the hinge member 33 is perpendicular to the hinge member 26, the hinge members may be selectively disconnected, whereas after the hinge member 33 has been pivoted out of a position perpendicular to the hinge member 26, the hinge construction cannot be disconnected.

It is to be observed that when the refrigerator door 17 is swung open about the axis of the hinge construction 18, as shown in Figure 8, co-operating load supporting bearing surfaces are defined by the upper and lower ends of the sleeve 34 of the hinge member 33 and the adjacent ends of the sleeves 27 of the hinge member 26.

A modified form of hinge construction 18' is shown in Figure 9. Primed reference numerals have been employed to indicate those parts which are the same or similar to the parts of the hinge construction 18 hereinbefore described. As shown in Figure 9, the bushing 35', which is revolvably mounted in the sleeve 34' of the hinge member 33', has a wedge-shaped slot 46 formed therein. The slot 46 is adapted to be disposed in co-engagement with the intermediate wedge-shaped portion 47 of a hinge element secured in the end of the hinge member 26'. A slot or opening 37' is formed in the sleeve 34' of the hinge member 33', through which the wedge portion 47 is adapted to be passed. The hinge construction 18' operates in the same manner as the hinge construction 18 described hereinbefore.

The following discussion is applicable to either form of hinge construction, 18 or 18'. However, for the sake of clarity, reference will be made only to the hinge constructions 18.

Since the hinge constructions 18 are in a position to be disconnected when the hinge members 33 are perpendicular to the hinge members 26, that is, when the refrigerator door 17 is closed, I have provided suitable latch means, indicated generally by the reference numeral 19, adjacent each side of the refrigerator door 17, for selectively securing the refrigerator door in a closed position, independently of the aforedescribed hinge constructions 18. The latch means 19 are of identical construction. One of the latch means 19 is shown in Figure 11, and comprises a hinge 51 which includes a hinge member or plate 52 secured to the outer side of the refrigerator body 16. Pivotaly mounted to the hinge member 52, about a hinge pin 53, is a hinge member or plate 54. Secured to the outer face of the hinge member 54, perpendicular thereto, is a lock pin 55 having an enlarged cone-shaped head 56.

Mounted within the refrigerator door 17, adjacent the side thereof, is a latch body member 57 which has parallel openings 58 and 59 formed therein. Mounted within the opening 58 is a tubular plunger 60, which, at its one end, is beveled and is adapted to engage the internal beveled portions of the jaw elements 66 which define an expansible collar member. The jaw elements 66 are normally biased inwardly by means of a garter spring 65. The jaw elements 66 have radially inwardly extending flange portions 67, which are adapted to engage the periphery of the lock pin 55 intermediate of the outer conical end portion 56 and the hinge plate 54. Secured within the tubular plunger 60 is a plunger actuator 68. A cap member 64 is slidably mounted in the tubular plunger 60. Interposed between the inner end of the actuator 68 and the cap member 64 is a coil spring 69. The outer end of the actuator 68 engages the one end of a handle 70, which is fulcrumed at 71 within a suitable closure member 72 secured to the outer surface of the refrigerator door 17. A suitable coil spring 73 is disposed concentrically about the actuator 68, and the spring 73 at one end engages the latch body member 57 and at its other end engages the end of the handle 70. A coil spring 82 is disposed concentrically about the actuator 68, and at one end en-

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gages the end of the plunger 60 and at the other end engages the latch body member 57. A suitable cover member 74 is secured to the latch body member 57 and is primarily provided for restraining axial movement of the jaw elements 66 of the expansible collar member, although permitting free radial movement of the jaw elements 66. A central opening 75 is formed in the cover member 74 for permitting the lock pin 55 to extend therethrough.

Disposed in the opening 59 in the latch body member 57 is a secondary plunger member 76, which is normally spring biased outwardly of the body member 57 by means of a coil spring 77. Mounted for sliding movement within the cover member 74 is a pin member 78. The pin member 78, at its one end, has an enlarged head portion 79, which engages the adjacent end of the secondary plunger 76. A suitable opening 80 is formed in the hinge plate 54, through which the pin member 78 is adapted to extend.

The operation of the latch means is as follows:

When it is desired to release the latch means 19, the handle 70 is pulled away from the refrigerator door 17, thereby causing the handle 70 to pivot in a clockwise direction, as viewed in Figure 11, about the fulcrum mounting 71. Clockwise pivotal movement of the handle 70 causes the actuator 68 and the plunger 60 to be urged inwardly of the refrigerator door 17. Upon inward movement of the plunger 60, the beveled end of the plunger 60 engages the beveled ends of the jaw elements 66 causing the latter to be expanded radially. Simultaneously, the cap member 64, normally in contact with the cone 56, causes the spring 69 to be compressed. The spring 69 is progressively compressed until the radial flange portions 67 of the jaw elements 66 are withdrawn from engagement with the cone 56. At substantially the moment that the jaw elements 66 are withdrawn from engagement with the cone 56, the plunger 60 is moved into position within the inner cylindrical portion of the jaw elements 66 and the spring loaded cap member 64 presses against the cone 56, initially springing the door 17 open. It is to be noted that when the lock means is in the position shown in Figure 11, the end of the pin 78 engages the edge of refrigerator body 16, thereby maintaining the secondary plunger 76 in a depressed position, preventing the latter from interfering with the radial expansion of the jaw elements 66 of the expansible collar member. After the jaw elements 66 have been expanded, they are moved into a position overlying the opening 59 formed in the latch body member 57 and are held in this position by the plunger 60 disposed within the inner cylindrical portion of the jaw elements 66. While the jaw elements 66 are in this position, the plunger 76 is rendered inoperative, as shown at the left end of Figure 10. Upon closing of the door 17, cone 56 first contacts element 64, which urges the plunger 60 out of engagement with the jaw elements 66 and permits the latter to contract to their normal position behind the cone 56.

After the door 17 has been initially sprung open, a further pulling force exerted on the handle 70 causes the door 17 to pivot about the hinge constructions 18 disposed at the side of the door opposite to the latch means being disengaged.

The hinge constructions 18, at the upper and lower ends of the refrigerator door 17, adjacent the side at which the latch means is released, are disengaged simultaneously with the latch means. The hinge constructions 18 become disconnected by virtue of the fact that the slots 36 in the bushings 35 align with the slots 37 formed in the sleeves 34 of the hinge members 33, as may be best seen in Figure 7, thereby permitting the slots 36 to be withdrawn from co-engagement with the intermediate portions 29 of hinge elements 28.

When the latch means, adjacent one side of the refrigerator door 17, has been released, neither the latch means nor the hinge construction adjacent the other

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side of the refrigerator door can be released or disconnected. It will be seen, at the right end of Figure 10, that, when the left side of the refrigerator door 17 has been swung toward an open position the end of pin member 78 is withdrawn from engagement with the edge of the refrigerator body 16 and the spring biased plunger 76 is permitted to move outwardly of the opening 59 in the body member 57. Upon such outward movement of the plunger 76, the latter is disposed in the path of radial movement of the jaw elements 66 of the expansible collar member. When the plunger 76 is in the path of radial movement of the jaw elements 66, it will be readily apparent that the latter cannot be expanded and thus cannot be released from engagement with the lock pin 55 carried by the adjacent hinge element 54. Correspondingly, as explained hereinbefore, the hinge elements of the hinges at the right side of the door will interlock as the door is opened at the left side.

If it is now desired to open the refrigerator door 17 at its right side, the door 17 is first closed at its left side, at which time the pin member 78 of the latch means 19, at the right side of the door 17, engages the adjacent edge of the refrigerator body 16 and is depressed for urging the plunger 76 inwardly relative to the latch body member 57. Thus, the plunger 76 is moved out of the radial path of movement of the jaw elements 66 and the latter may be expanded by pulling on the handle 70, at the right side of the door 17, in the same manner as was described hereinbefore in connection with the description of the operation of the latch means 19 at the left side of the door 17.

A continuous resilient sealing member 90 is secured to the refrigerator body 16 along the edges of the opening in the forward end of the latter, and the member 90 when compressed between the door 17 and the body 16 provides a suitable seal for preventing the passage of air past the edges of the door. It is to be further noted that the latch means do not extend into the cooled portion of the refrigerator body and thus do not conduct cold from the interior of the refrigerator body to the exterior thereof.

Now, while I have shown and described what I believe to be preferred embodiments of my present invention, it will be understood that various modifications and rearrangements may be made therein without departing from the spirit and scope of my present invention.

I claim:

1. In a disconnectable hinge structure, the combination of a first hinge member having a first hinge element non-rotatable relative thereto, said first hinge element having an intermediate non-circular portion, a second hinge member having a second hinge element revolvably mounted therein, said hinge elements being restrained against relative endwise movement and said second hinge element having a slot conforming to the intermediate non-circular portion of said first hinge element to provide for co-engagement of said first and second hinge elements, leaf spring means carried by said second hinge member engaging said second hinge element and yieldingly restraining rotation thereof and thereby aligning the slot in said second hinge element with the intermediate portion of said first hinge element prior to engagement of said first and second hinge elements, and the intermediate non-circular portion of said first hinge element being locked within the slot in said second hinge element after said first and second hinge elements have been disposed in engagement and upon relative rotation of said second hinge element and member during initial pivotal movement of one of said hinge members relative to the other of said hinge members.

2. The hinge structure of claim 1 wherein the intermediate non-circular portion of said first hinge element has an intermediate rectangular cross-section, and in which the slot of said second hinge element is rectangular conforming to the intermediate rectangular portion of

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said first hinge element to provide for co-engagement of said first and second hinge elements.

3. In a disconnectable hinge structure, the combination of a first hinge member having a first hinge element non-rotatable relative thereto, said first hinge element having an intermediate wedge-shaped portion, a second hinge member having a second hinge element revolvably mounted therein, said second hinge element having a wedge-shaped slot conforming to the intermediate wedge-shaped portion of said first hinge element to provide for co-engagement of said first and second hinge elements, leaf spring means carried by said second hinge member engaging said second hinge element and yieldingly restraining rotation thereof and thereby aligning the wedge-shaped slot in said second hinge element with the wedge-shaped portion of said first hinge element prior to engagement of said first and second hinge elements, and the wedge-shaped portion of said first hinge element being locked within the wedge-shaped slot in said second hinge element after said first and second hinge elements have been disposed in engagement and upon relative rotation of said second hinge element and member during initial pivotal movement of one of said hinge members relative to the other of said hinge members.

4. In a disconnectable hinge structure, the combination of a first hinge member having a pair of spaced axially aligned tubular portions formed at the upper and lower ends thereof, a first hinge element non-rotatably mounted at its ends in said tubular portions of said first hinge member, said first hinge element having an intermediate non-circular portion, a second hinge member having a tubular portion formed at one end thereof, the length of the tubular portion of said second hinge member being slightly less than the distance between the tubular portions of said first hinge member whereby when said tubular portions are disposed in mating relation load supporting bearing surfaces are defined between the upper and lower ends of the tubular portion of the second hinge member and the adjacent ends of the tubular portions of the first hinge member, a second hinge element revolvably mounted in the tubular portion of said second hinge member, said first and second hinge elements being restrained against relative endwise movement and said second hinge element having a slot conforming to the intermediate non-circular portion of said first hinge element to provide for co-engagement of said first and second hinge elements, a slot formed in said tubular portion of said second hinge member through which said first hinge element may be passed for engagement with said second hinge element, and the intermediate portion of said first hinge element being locked within the slot in said second hinge element by the tubular portion of said second hinge member after said first and second hinge elements have been disposed in engagement and upon initial pivotal movement of one of said hinge members relative to the other of said hinge members.

5. For use with a door having latch means at each side thereof for securing the door to a door frame and with the latch means being individually releasable so that the door may be swung about the unreleased latch means, the combination of disconnectable hinge structures at each side of the door frame, each of said disconnectable hinge structures comprising a first hinge member secured to the door frame and having a first hinge element non-rotatable relative thereto, said first hinge element having an intermediate non-circular portion, a second hinge member secured to the door and having a second hinge element revolvably mounted therein, said hinge elements being restrained against relative endwise movement and said second hinge element having a slot conforming to the intermediate non-circular portion of said first hinge element to provide for co-engagement of said first and second hinge elements, and said second hinge member serving to lock the intermediate

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non-circular portion of said first hinge element within said second hinge element after said first and second hinge elements have been disposed in engagement and upon initial pivotal movement of said second hinge member relative to said first hinge member.

6. For use with a door having latch means at each side thereof for securing the door to a door frame and with the latch means being individually releasable so that the door may be swung about the unreleased latch means, the combination of disconnectable hinge structures at each side of the door frame, each of said disconnectable hinge structures comprising a first hinge member secured to the door frame and having a first hinge element non-rotatable relative thereto, said first hinge element having an intermediate approximately rectangular portion, a second hinge member secured to the door and having a second hinge element revolvably mounted therein, said second hinge element having an approximately rectangular slot conforming to the intermediate approximately rectangular portion of said first hinge element to provide for co-engagement of said first and second hinge elements, and said second hinge member serving to lock the approximately rectangular portion of said first hinge element within the approximately rectangular slot of said second hinge element after said first and second hinge elements have been disposed in engagement and upon initial pivotal movement of said second hinge member relative to said first hinge member.

7. For use with a door having latch means at each side thereof for securing the door to a door frame and with the latch means being individually releasable so that the door may be swung about the unreleased latch means, the combination of disconnectable hinge structures at each side of the door, each of said disconnectable hinge structures comprising a first hinge member secured to the door frame and having a first hinge element non-rotatable relative thereto, said first hinge element having an intermediate wedge-shaped portion, a second hinge member secured to the door and having a second hinge element revolvably mounted therein, said second hinge element having a wedge-shaped slot conforming to the intermediate wedge-shaped portion of said first hinge element to provide for co-engagement of said first and second hinge elements, and said second hinge member serving to lock the wedge-shaped portion of said first hinge element within the wedge-shaped slot of said second hinge element after said first and second hinge elements have been disposed in engagement and upon initial pivotal movement of said second hinge member relative to said first hinge member.

8. In a disconnectable hinge structure, a first hinge member having aligned sleeves, a hinge element mounted in and extending between said sleeves and restrained against endwise movement relative thereto, a second hinge member having a sleeve disposed and adapted to fit between said sleeves of said first member, and a bushing conforming to and fitting within said sleeve of said second hinge member and revolvable for relative turning movement therein, said bushing having an outwardly opening recess conforming to and receiving said hinge element, said sleeve of said second hinge member serving to close said recess to lock said element within said recess upon relative pivotal movement of said hinge members after engagement of said element in said recess.

9. In a disconnectable hinge structure, a first hinge member having aligned sleeves, a hinge element mounted in and extending between said sleeves and restrained against both endwise movement and turning movement relative thereto, the portion of said element between said sleeves being of non-circular cross-section, a second hinge member having a sleeve disposed and adapted to fit between said sleeves of said first member, and a bushing conforming to and fitting within said sleeve of said second hinge member and revolvable for relative turning

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movement therein, said bushing having an outwardly opening recess conforming to and receiving said portion of said element and said sleeve of said second hinge member having an opening accommodating entry of said portion of said element into said recess, said sleeve of said second hinge member serving to lock said element within said recess upon relative pivotal movement of said hinge members after engagement of said element in said recess.

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