REFRIGERATOR DOOR AND ADJUSTABLE PRESSURE EQUALIZING DEVICE

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Generically this invention relates to door structures of the refrigerator type, but it is more particularly directed to a refrigerator or cooler door for a walk-in type of refrigerator or cooler structure used for freezing and storing large amounts of perishable produce, and this application is a continuation in part of my application Serial Number 58,476, filed November 5, 1948, now abandoned.

In a walk-in refrigerator and cooling structure of this nature there frequently occurs distorting or warping of the cooler wall adjacent to the door opening, resulting from settling of the floor by reason of the weight of the door itself and the more or less continuous charging of the stock tonnage, which distortion or warping prevents uninterrupted or complete sealing of the outer panel of the door with the outer refrigerator wall surface bounding said door opening, thereby permitting ingress of warm air and egress of cool air from the cooler, and, therefore, one of the principal objects of this invention is the provision of a flexible door structure comprising a panel adapted to sealingly overlie the exterior surface of the refrigerator wall bounding the door opening and including a flexible off-set structure of a thickness substantially corresponding to that of the cooler wall adapted to self-aligning project within the door opening, and an adjustable pressure equalizing means in connection with said offset structure and said panel for effecting co-planing pressure of said panel on said wall to effect sealing of the door opening irrespective of the warping of the wall structure surrounding said door opening.

This invention is particularly adapted to comparatively long doors of walk-in type refrigerators and in which a single can latch is used at the center of the striking edge of the door to lock the door in closed position. In doors of this type, the latch insures close contact of the center of the striking edge of the door, and it frequently happens that the outer face of the door becomes concave causing the top and bottom ends of the striking edge to bend outwardly from the refrigerator wall or framework, even when the door is locked, and thereby permits leakage of warm outside air into the refrigerator; therefore, a further principal object of this invention is the provision of a flexible door structure for a walk-in refrigerator and cooler, said structure comprising a front panel of greater area than that of the door opening and including a gasket adapted to sealingly engage the cooler wall bounding the door opening, a flexible off-set structure including a rear panel is mounted on the rear surface of said front panel adapted to extend within said door opening, a bowed pressure equalizing and adjusting bar mounted in said off-set structure and medically adjustable connected to said rear panel underlying said latch structure and adapted to provide equal three point pressure on the striking edge of the door, comparable to the three hinges on the anchoring side of said door, and assuming a coplaning of the gasketed surface of said front panel with the surface of said cooler wall for sealing said door opening irrespective of the warping of said wall.

Another important object of this invention is the provision of a door structure for walk-in types of refrigerators comprising a front panel of an area greater than that of the door opening, and a flexible off-set structure having end pieces, side panels and a rear panel, said structure carried by and having flexible connection with said front panel and adapted to project within the door opening, an adjustable pressure equalizing bar means mounted within said structure, and means in connection with said equalizing means and operable exterior of said rear panel to effect adjustment of said equalizing means to effect flexing of said front panel, to bring said panel into sealing relation with respect to the underlying refrigerator wall surface irrespective of the warping of said wall.

The improved construction of the present invention will become more readily understood by reference to the accompanying drawing which illustrates one form or embodiment of the improved construction, in which:

Fig. 1 is a perspective view of a walk-in refrigerator and door partly opening and with parts being shown as broken away, the door embracing the features of this invention.

Fig. 2 is a vertical sectional view through the door and equalizing bar.

In the illustrated embodiment characterizing this invention there is shown one form of a walk-in refrigerator A comprising a front wall 1, a door B mounted on said wall and adapted to close the door opening 2 formed in said wall. Said door opening 2 is provided with a liner 3. Said door opening 2 is adapted to be closed by the door B which is intended to sealingly close said opening to prevent ingress of warm outside air into the refrigerator A with consequent loss or impairment of refrigeration temperature therin.

The door B is mounted on front wall 1 with a three point connection by the hinges 4 and secured to the wall and door respectively by screws or bolts 7, and has mounted midway of its length at its striking edge, a conventional type of retractable latch mechanism 5, secured by screws 6 and which is adapted to engage and releasably latch with a complemental strike 7 mounted in alignment therewith on wall 1 spaced from the liner 3 of door opening 2 and secured by bolts or pins 7.

The door B which embraces the features of the present invention, comprises an outer wall panel 8 of an area greater than the door opening 2 and the peripheral edge 9 of which, is adapted to seat on the surface of wall 1 bounding the door opening 2 to sealingly close said opening 2 when the door is in closed position as will directly more fully appear.

The door B has mounted on its inner surface an off-set structure C comprising an anchor means 10 suitably secured to the rear surface of panel 8 spaced downwardly from its upper edge, and a similarly mounted and secured means 11 spaced upwardly from the bottom edge of said panel. Mounted respectively on the means 10 and 11 are the upper and lower end members 12 and 13 respectively.

The upper end member 12 extends downwardly and outwardly from front panel B, a distance corresponding to the width of liner 3 and the thickness of wall 1, and the lower end 13 extends upwardly and outwardly at a corresponding angle from the front panel B. Suitably mounted on the outer or rear side edges of members 12 and 13 is a rear panel D suitably secured to said members 12 and 13, the ends of panel D are spaced inwardly from the outer surfaces of said members to form a moulding 14 adapted to circumference and secured said rear panel D, said ends 12 and 13 are secured to the means 10 and 11 by screws 15 and to the front panel B by screws 16 in a manner to effect a flexible conne-
tion between the off-set section C and panel B for a purpose hereinafter more fully appearing. The opposite end of the respective upper and lower members 12 and 13 are inclined outwardly from outer panel 8 to rear panel D in meeting direction so that the opposite edge panels 18 will be inclined from panel 8 in meeting direction corresponding to that of members 12 and 13. It will be noted that the edges of the door are closed by facing panels, one of which is shown fragmentarily at 18, this panel closing the outer vertical edge of the door and a similar panel 18 closing the inner vertical edge as will be apparent. It might be further stated with respect to front panel B that it extends beyond the end members 12 and 13 and correspondingly beyond the facing panels 18 providing a continuous flange 19 bounding said off-set structure, and along its peripheral edge under surface is suitably secured a rubber or other suitable sealing gasket 20 adapted to engage the surface of wall B to assure an air-tight seal when the door B is in closed and co-planing position with said wall.

The insulating space 21 between the panels B and D is adapted, if desired, to receive insulating material 21', and mounted in the insulating space 21 is an adjusting and pressure equalizing bar 22 which is substantially U-shaped, disposed in cross section forming channel 23. Said bar is curved or bowed from the ends thereof uniformly towards the middle of the bar in the direction of the latch mechanism 5 when operatively positioned (Figs. 1 and 2), and adapted to receive at its center an adjusting bolt 24 threaded as indicated at 25 for threaded engagement therewith as at 26. Said bolt is adapted to extend through said rear panel D and terminates in an integral head nut 27, and a washer 28 is mounted intermediate said head nut and the rear panel D. Also mounted on said bolt 24 on the opposite side of rear panel D is a washer 29 washed or secured to said bolt by a cotter-pin or the like. The ends of said bar are adapted to seat on end members 12 and 13 adjacent the rear panel D and are secured to said ends by screws 30.

It is obvious that since the rigid bar 22 is pivoted and coacts with the center of the striking edge of the door B, the adjusting screw 24 provides by means of a suitable wrench engageable with the head 27, the manual means of adjusting the bar 22 to effect concaving or convexing of the panel B to compensate for warping of the wall B bounding the door opening 2. Also, since bar 22 is pivoted at the center of the striking edge it provides automatic adjustment of the striking edge of the door to a co-planing engagement with the cooler wall B in event of distortion thereof in relation to the hinged section resulting from a fluctuating floor level often caused by a change of merchandising tonnage.

It will also be observed that the present device comprises a front door panel and an off-set structure flexibly connected to said panel and, owing to the pivotal mounting of the adjusting bar, said off-set structure is self-adjustable within the door opening irrespective of slight distortion of the complementarily inclined door lining and also with respect to the flexing of the panel B by the adjustable bolt 24 to effect proper co-planing or aligning of the engaging gasketed surface of the panel with the refrigerator wall 1 as heretofore described. It will be noted also, that in view of the pivoted locking point of the door B, and that of the pressure equalizing bar, engagement of the door latch with the adjustable complementarily wall strike provides an equal three point pressure on the flange gasket of the striking edge or free edge of the door comparable with the three hinged anchorage of the opposite side of said door.

It is therefore obvious that the off-set flexible structure is to an extent automatically self-aligning, but in case of unusual distortion such condition is remedied by adjusting the equalizing bar 22 by selective actuation of the adjusting screw 24 to concavedly or convexedly flex the panel B to effect sealing engagement of the gasketed surface of the panel with the contacting wall surface of the wall to compensate for warping thereof.

In the invention hereinafter more fully appearing, a refrigerator construction and an adjustable flexible door structure of the character described, comprising few parts manufactured at a minimum cost, readily assembled and adapted to maintain an air seal with respect to the door opening throughout the life of the structure irrespective of bowing or surface changes of the door incident to the varying effects of usage and/or changes effecting the engageable surfaces of the door, incident to wear and tear and the varying effects of continual usage, such structure being efficient for the purposes intended.

Although in practice it has been found that the form of the invention illustrated in the accompanying drawings and referred to in the above description as the preferred embodiment is the most efficient and practical, yet realizing that conditions concurrent with the adoption of my invention will necessarily vary, it is well to emphasize that various minor changes in details of construction, proportion and arrangement of parts, may be resorted to within the scope of the appended claims without departing from or sacrificing any of the principles of this invention.

Having thus described the invention, what I desire protected by Letters Patent is as set forth in the following claims:

1. A walk-in refrigerator room construction comprising a wall structure defining a walk-in door opening and a flexible door structure mounted on the wall structure adjacent to the opening for closing the said opening, the door structure comprising a front door panel adapted to overlie the exterior surface of the refrigerator wall bounding the door opening, a flexible off-set chamber structure including a flexible top end member, a flexible bottom end member, and a rear panel mounted on the rear of the top and bottom end members and defining a closure for the flexible off-set chamber structure, this structure being mounted on the rear of the front door panel and having a thickness substantially corresponding to that of the wall structure and adapted to self-aligningly project within the door opening, and an adjustable pressure equalizing means vertically disposed in the off-set chamber structure and bearing against the flexible top and bottom end members in the chamber structure contiguously to the said rear panel for effecting co-planing pressure of the front panel and of the flexible top and bottom end members of the chamber structure on the wall structure exterior surface, to effect sealing of the door opening irrespective of warping of the wall structure surrounding the door opening.

2. A walk-in refrigerator construction room comprising a wall structure defining a walk-in door opening, and a flexible door structure hingedly mounted on the wall structure by three equally spaced anchoring hinges adjacent to the opening for closing the said opening, the door structure comprising a front panel adapted to overlie the exterior surface of the refrigerator wall bounding all portions of the door opening, one side of the panel being the striking surface of the door, a single cam latch on the panel disposed centrally of the striking edge of the door for latching the door in closed position, a sealing gasket on the panel extending peripherally therearound adapted to sealingly engage the exterior of the wall structure bounding the door opening, a flexible off-set chamber structure mounted on the front panel rearwardly thereof, the said chamber structure being adapted to extend within the door opening when the door is closed and including a rear panel, upper and lower flexible end portions and side portions mounted on the rear surface of the front panel and extending rearwardly thereof, the rear panel being mounted on the said portions and defining therewith a closed heat insulating chamber carried by the rear surface of the front panel, a bowed pressure equalizing adjusting bar mounted vertically in the chamber and en-
gaging the flexible upper and lower end members thereof contiguous to the rear panel, the bar being bowed convexitely toward the front panel with maximum curvature medially or directed outwardly from the bar, and the bar medially connected thereto and to the rear panel underly-
ing the cam latch on the front panel to provide equal three-point pressure on the striking edge of the door comparable to the hinges on the anchoring side of the door, and assuring a co-planing of the sealing gasket of the front panel with the surface of the wall structure for sealing against the exterior of warping of the wall structure and door opening.

3. A walk-in refrigerator room construction comprising a cold room adapted to receive tonnages of perishable produce to be refrigerated and comprising a wall structure having a walk-in door opening therein and a massive door structure hingedly mounted on an outer surface of the wall structure adjacent to a side of the door opening, the door structure including a front door panel having an area substantially greater than that of the door opening and overlying the outer surface of the wall structure completely around the door opening, a flexible offset chamber structure mounted on the rear of the front panel and defining a closed heat insulating chamber on the rear of the front door panel and defining with the periphery of the front panel a continuous sealing flange overlying all portions of the outer surface of the wall structure surrounding the door opening, a sealing gasket intermediate the said sealing flange and underlying portions of the wall structure for sealingly enclosing the door opening when the door is closed, the flexible offset chamber structure being the only portion of the door which extends into the door opening, a convexly bowed pressure member vertically mounted in the offset chamber structure with its ends yieldably connected to flexible top and bottom members of the said structure and contiguous to a rear panel forming a rear closure for the offset structure, the pressure member being convexly bowed towards the front panel, and adjusting means connected to the pressure member and extending through the rear panel for effecting selected adjustment of amounts of flexure of the bowed pressure member on the flexible top and bottom members of the chamber structure for flexing the front panel and maintaining the overlapping seal between the continuous flange portion of the front panel and the outer surface of the wall structure irrespective of random deformations in contour of the door opening produced by warpage thereof incident to changes in tonnages of commodities being refrigerated in the cold room.

4. A walk-in refrigerator room construction comprising a wall structure provided with a walk-in door opening and a flexible large wooden door structure mounted on the wall structure adjacent to the opening for closing the opening, the door structure comprising a planar front door panel marginally overlying the exterior surface of the wall structure completely around the periphery of the door opening, a sealing gasket mounted on the front door panel and extending completely around the periphery thereof and also overlapping all margins of the door opening, for sealing any spaces between the margins of the door opening and of the front door panel in air-tight relation, and an adjustable offset chamber structure yieldably mounted on rear surface of the front door panel by means of oppositely directed fastening elements, the chamber structure abutting the gasket and entering the door opening to a depth substantially equal to the thickness of the wall structure, the said chamber structure having flexible top and bottom members and side panels all attached directly to the rear surface of the front door panel oppositely directed fastening elements, and a rear panel carried by the said flexible top and bottom members and the side panels, and defining a closure for the chamber structure, a single bowed pressure bar means convexly bowed in the mid-portion in direction of the front door panel, the bar being vertically disposed in the chamber and having opposite ends engaging the flexible top and bottom end members of the chamber contiguous to the rear panel for adjusting the chamber structure to change the engagement of the chamber and front panel with respect to adjacent portions of the wall structure surrounding the door opening as required for compensation of warpage of the wall structure surface surrounding the door opening for altering the wall engaging surface of the door and gasket to effect sealing engagement of the marginal portions of the door for maintaining the opening completely sealed against the external air, and adjusting means for the pressure bar means extending through the said bar means and the rear panel for selectively increasing and decreasing the effective length of the pressure bar means to adjust the chamber structure to variations in shape of the door opening caused by such warpage.

5. A walk-in refrigerator room construction as claimed in claim 4, wherein the adjusting means for the pressure bar means are symmetrically disposed with respect to the pressure bar means and the front and rear panels of the door, and the pressure bar means having opposite ends yieldingly engaging with the top and bottom members of the adjustable chamber at points contiguous to the rear panel structure for effecting a compensating warping or deformation of the chamber structure to compensate for the warpage of the wall structure and door opening.

6. A walk-in refrigerator room construction as claimed in claim 5, wherein the front door panel is provided with three equally-spaced points of support producing an anchored edge for the door, one of the points of support being a median hinge anchor a single cam-acting latch on the door directly across the front panel from the median hinge anchor, with the adjusting means for the pressure bar mounted directly and in horizontal alignment behind the latch so that the projection of the adjusting means through the rear door panel together with the engagement of the ends of the pressure bar with the top and bottom members of the adjustable chamber structure provide three point pressure on the striking edge of the door comparable to the three-point support on the anchoring side of the door, thereby assuring a co-planing of the sealing gasket of the front door panel with the outside surface of the room wall structure for sealing the door opening irrespective of warping of the wall structure and door opening.

7. A large walk-in refrigerator or cold-room structure and corresponding walk-in door opening therefor, comprising a flexible massive door structure for closing the opening and including a massive front door panel adapted to sealingly overlap the wall surface bounding the door surface, a flexible offset chamber structure mounted on the front door panel and extending into the door opening when the door is closed, the said flexible offset chamber structure including flexible top and bottom members and a rear panel closing the chamber structure, oppositely directed fastening means flexibly mounting the flexible offset chamber structure on the front door panel on its inner side when the door is closed so that the flexible offset chamber structure enters the door opening, the front door panel having a free side and a mounted side, the latter having a three-point hinged connection spaced from the door opening, a vertically disposed bowed pressure bar in the chamber structure adjacent to the free side of the door, the said pressure bar having opposite ends seating on the flexible top and bottom members of the chamber structure adjacent to the rear panel, the pressure bar being bowed convexly towards the front door panel, an adjusting screw having connection spaced from the bar medially thereof and rotatably anchored against longitudinal movement in the rear panel and extending exteriorly thereof and operable to effect selective lengthening or shortening of the bar to selectively concavely or convexedly flex the flexible end members of the chamber structure to effect peripheral sealing engagement of
the front door panel and chamber structure with the wall surface bounding the door irrespective of warping thereof, and a locking cam latch member mounted on the front door panel overlying the pressure bar, and adapted to effect in conjunction with the arm, a three point pressure similar to the anchored side of the door in door-closed position.

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