Oct. 19, 1943. L. G. BERGSTROM 2,332,195

SEALED HINGE MECHANISM

Filed July 26, 1941 3 Sheets-Sheet 1

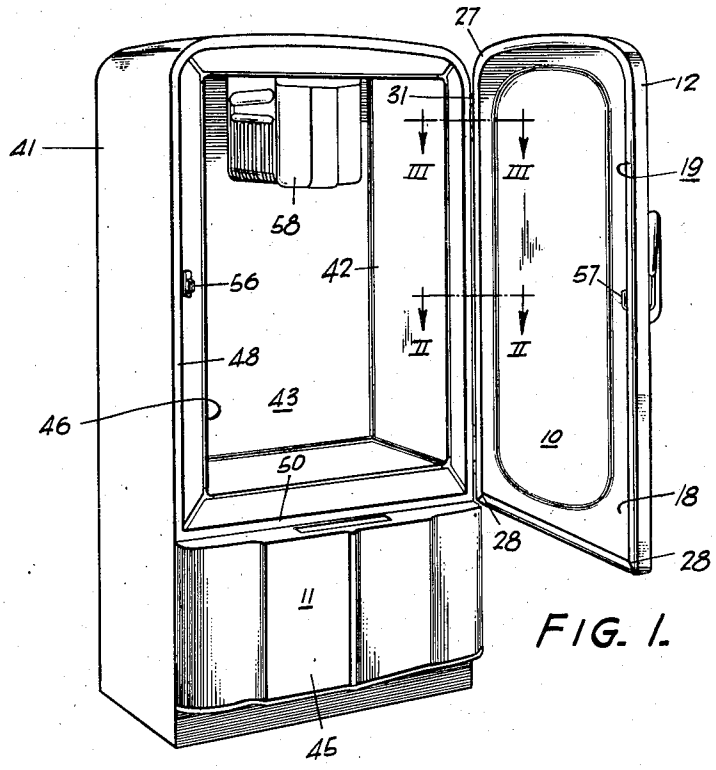


FIG. 1.

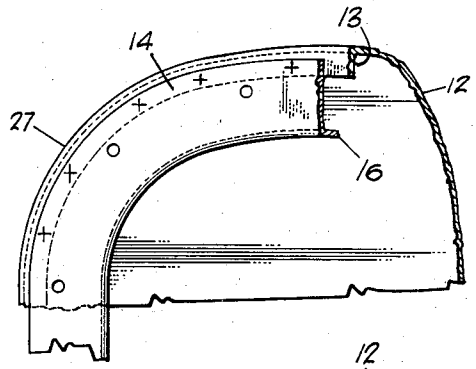


FIG. 6.

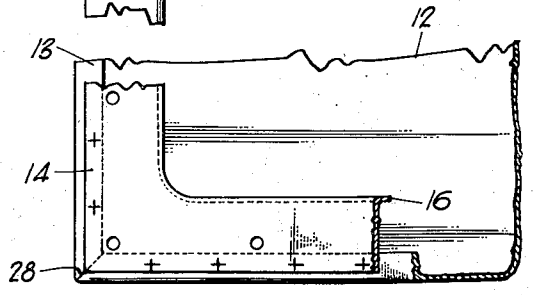


FIG. 7.

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SEALED HINGE MECHANISM

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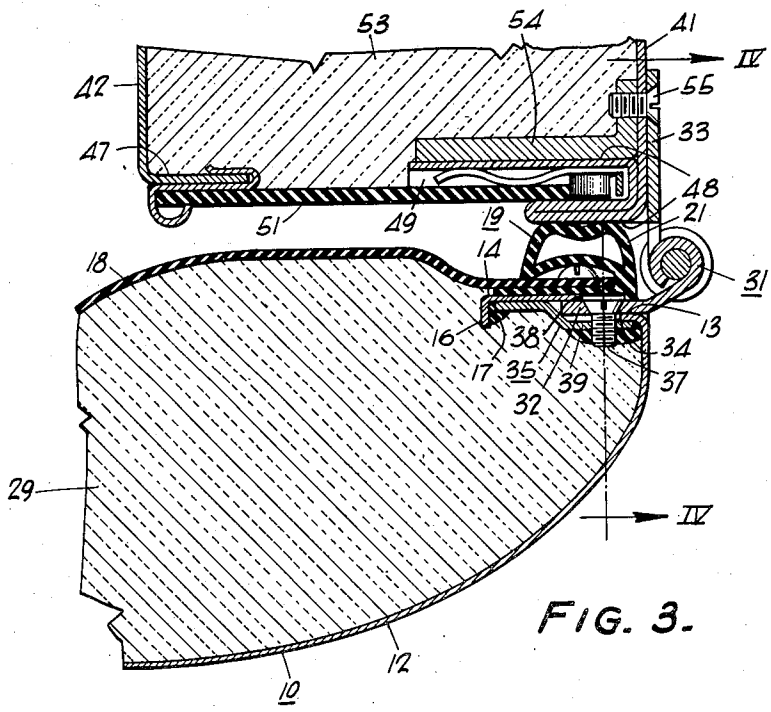


FIG. 3.

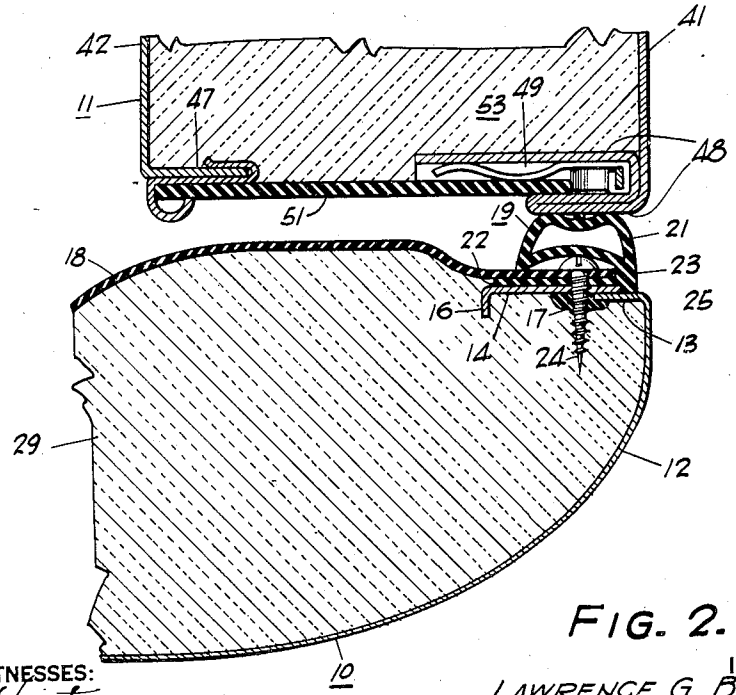


FIG. 2.

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SEALED HINGE MECHANISM

Filed July 26, 1941 3 Sheets-Sheet 3

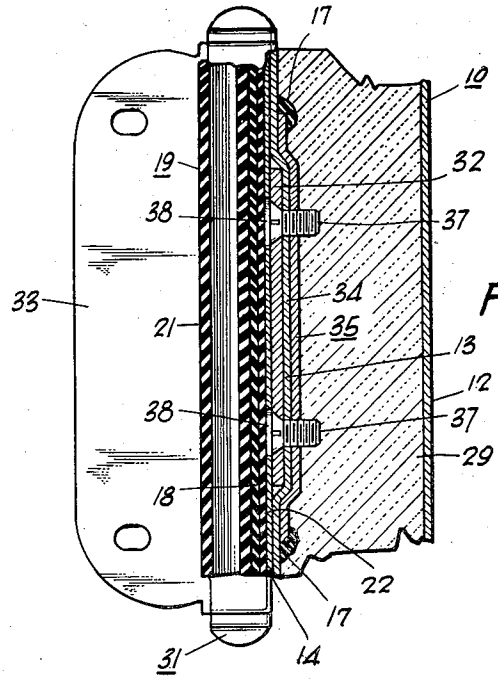


FIG. 4.

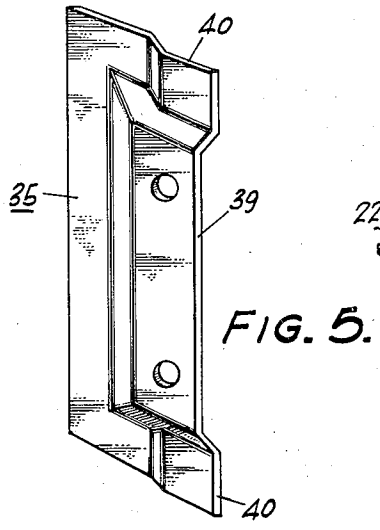


FIG. 5.

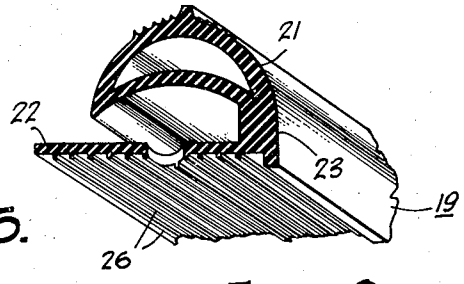


FIG. 8.

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Patented Oct. 19, 1943 2,332,195

UNITED STATES PATENT OFFICE

2,332,195

SEALED HINGE MECHANISM

Lawrence G. Bergstrom, Mansfield, Ohio, assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application July 26, 1941, Serial No. 404,174

6 Claims. (Cl. 20—35)

This invention relates to refrigerator cabinet construction and more especially to a refrigerator door construction at the door hinge.

The walls and insulation of refrigerated chambers are sometimes rendered ineffective and may deteriorate rapidly because of moisture accumulating in the interior thereof. The moisture accumulation is caused by small air passages which permit the ambient air to enter between the inner and outer walls. Such air carries moisture which tends to condense on the cold surfaces of the interior of the wall.

Condensation occurs, for example, in doors for refrigerator cabinets having an inner panel of heat-insulating material. A portion of the inner panel usually lies near the cold evaporator when the door is closed. This portion is cooled to a very low temperature by the evaporator since but little heat is conducted to said portion from the warmer portions of the panel because of the low heat-conducting characteristics of the panel. This portion of the panel is especially subjected to the condensation. If the inner panel is formed of one large sheet of impervious material which extends to the periphery of the door, an additional adverse factor is introduced because of the absence of joints which form ventilating openings by means of which moisture from the inner surface of the panel can be carried to the interior of the refrigerated chamber.

In refrigerator doors utilizing an inner panel of heat-insulating material which is impregnated or coated with a finishing material, the presence of moisture resulting in possible deterioration of the insulating material or the finishing material may produce unpleasant odors. Such doors are more likely to generate unpleasant odors in humid atmospheres than the conventional type of refrigerator door, wherein both the inner and outer panels are formed mainly of metal. The problem of effectively sealing such a door is, therefore, more acute and great care must be exercised to effect a vapor-tight seal to the interior of the door. The problem is more difficult because of the unusual and special construction of refrigerator doors of this type which, while extremely advantageous from the standpoint of heat leak factors and cost, present an unusual sealing problem because of the features of construction which produce the aforesaid advantages.

It is an object of the invention to provide a fluid-tight door construction at the point of securement of the door hinge.

A further object of the invention is to provide a strong hinge construction at the securement of the hinges to the door, which construction presents a pleasing exterior appearance.

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 view in perspective of a refrigerator cabinet embodying the door of this invention;

Fig. 2 is a fragmentary section on the line II—II of Fig. 1, the door being in the closed position;

Fig. 3 is a fragmentary section on the line III—III of Fig. 1, showing the construction at the door hinge, the door being in the closed position;

Fig. 4 is a fragmentary section on the line IV—IV of Fig. 3;

Fig. 5 is a view in perspective of the sealing and reinforcing plate adjacent the hinge structure;

Fig. 6 is an enlarged view of the construction of the upper corner of the door with the inner panel removed;

Fig. 7 is an enlarged view of the construction of the lower corner of the door with the inner panel removed; and

Fig. 8 is an enlarged view in perspective of a portion of the sealing gasket of the door.

Referring to the drawings for a detailed description of the invention, the reference numeral 10 designates a door for a refrigerator cabinet 11. The door construction is claimed in a co-pending application filed by Orland H. Yoxsimer on May 27, 1941, Serial No. 395,322. The door 10 comprises a dished outer panel 12 of sheet metal, the edges of which are bent inwardly throughout the periphery thereof to provide a short attachment flange 13 lying in one plane.

A frame 14 is spot-welded at its outer margin to the inturned flange 13 and forms an inward extension of the flange 13. The inner edge portion 16 of the frame 14 is bent at right angles to the remainder thereof to stiffen the frame 14. The joint between the frame 14 and the flange 13 is sealed with an asphalt sealing compound 17, such as "Hydrolene" to render the joint fluid-tight.

The door 10 comprises an inner panel 18 of thin, stiff, non-metallic material of good heat-insulating qualities, such as one of the new plastic materials or paper impregnated with a resinous condensation product and known by the trade-mark "Micarta." The panel 18 extends

substantially to the outer margin of the door 10. A sealing gasket 19 of rubber is disposed at the outer margin of the inner panel 18 and comprises a tubular section 21 and a flange 22 connected by a web 23 to one edge of the tubular section 21.

The flange 22 of the sealing gasket is interposed between the margin of the inner panel 18 and the frame 14, and the door structure is fastened together by closely spaced sheet metal screws 24 which pass through the inner panel 18, through the flange 22 of the sealing gasket 19, and engage the frame 14. The flange 22 of the gasket 19 is thus clamped between the margin of the inner panel 18 and the frame 14. The tubular portion 21 of the gasket 19 overlies the heads of the sheet metal screws 24, and the web portion 23 of the gasket 19 lies adjacent the outer edge of the inner panel 18 so that the gasket 19 completely surrounds the edge. The surface of the flange 22 adjacent the frame 14 is provided with longitudinal ridges 26 which aid in effecting a fluid-tight seal between the gasket 19 and the frame 14. The purpose of the frame 14 is twofold. It acts as a stiffening member for the door 10, and also provides a flat surface with which the flange 22 of the gasket 19 may effect a fluid-tight seal.

The gasket 19 is formed from a long strip of extruded rubber which is sufficiently flexible to bend around the upper rounded corners 27 of the inner panel 18 without wrinkling. The gasket 19 is mitred at the two lower corners 28 of the door 10 and the mitered sections of the gasket 19 are vulcanized together so that the gasket 19 is continuous throughout the periphery of the door 10. The interior of the door structure is filled with heat-insulating material 29.

In accordance with my invention, the door 10 is secured to the cabinet 11 by two hinges 31. Each hinge 31 comprises two hinge plates 32 and 33, one of which is secured to the door 10 and the other to the cabinet 11. A modification of the door structure is required at the point of securement of the hinge plate 32 to the door 10 and comprises a depressed portion 34 in the flange 13, providing an opening between the frame 14 and the flange 13 into which the hinge plate 32 may be inserted.

The depressed portion 34 of the flange 13 is reinforced by a heavy plate 35 which is formed with an offset 39 which underlies the depressed portion 34 and with two additional offsets 40 which underlie the immediately-adjacent portion of the flange 13. The reinforcing plate 35 extends beyond the edge of the flange 13 and contacts the inner surface of the frame 14. It is spot-welded to both the frame 14 and the flange 13 and all joints are sealed with a sealing compound 17 such as previously described. The reinforcing plate 35 thus also forms a closure for the opening between the depressed portion 34 of the flange 13 and the frame 14.

The hinge plate 32 is secured to the door 10 by flush-headed screws 37 which are inserted through an opening 38 in the frame 14 to secure the hinge plate 32 to the depressed portions 34 of the flange 13 and to the reinforcing plate 35. The joints between the hinge plate 32 and the reinforcing plate 35, the flange 13, and the frame 14 are also sealed with a sealing compound 17, such as previously described.

The refrigerator cabinet 11 is of the type described in Patent No. 2,213,155, granted to O. H. Yoxsimer on August 27, 1940. The cabinet 11 comprises an outer shell 41 divided by a horizontal partition (not shown) into a food storage compartment 43 in the upper part of the cabinet 11 and a machine compartment 45 below the food compartment 43. An inner shell or food liner 42 is located in the food storage compartment 43 with its walls spaced from the outer shell 41 and the partition, respectively. The food storage compartment 43 has an access opening 46 for which the door 10 is the closure. The inner shell 42 is provided with an outwardly-turned flange 47 and the outer shell 41 is provided with an inwardly-turned flange 48 which is doubled back on itself and then bent reversely to form a groove 49. The partition (not shown) is provided with a flange 50 similar to the flange 48 of the outer shell 41 and welded at its extremities thereto. The space between the outwardly-turned flange 47 of the inner shell 42 and the inwardly-turned flanges 48 and 50 of the outer shell 41 and of the partion respectively is bridged by a heat breaker strip 51 of stiff heat-insulating material.

The flanges 47, 48, and 50 are in such relationship with one another that the breaker strips 51 lie in one plane at the circumference of the access opening 46. The space between the inner shell 42 and the walls comprising the outer shell 41 and partition is filled with heat-insulating material 53. All of the joints in the outer walls of the food compartment and the partition are either welded in fluid-tight engagement or are spot-welded and sealed with a sealing compound so that the outer shell about the food liner is sealed against the passage of air.

The hinge plate 33 is secured to the outer shell 41 of the refrigerator cabinet 11. To reinforce the portion of the cabinet 11 to which the hinge plate 33 is secured, a heavy L-shaped bar 54 is spot-welded to the adjacent interior surface of the outer shell 41. The long arm of the L-shaped bar 54 lies against the inturned flange 48 of the outer liner 41 and is also spot-welded to the flange 48. The hinge plate 33 is secured to the outer shell 41 by flush-headed screws 55 which pass through the outer shell 41 and engage cooperating threads in the L-shaped bar 54. The cabinet 11 is provided with a latch strike 56 which engages a latch (not shown) in the interior of the door 10 through an opening 57 in the inner panel 18. An evaporative cooling unit 58 is located in the upper portion of the food compartment 43.

When the door 10 is closed, the sealing gasket 19 seals against the inwardly-turned flanges 48 and 50 of the outer shell 41 and of the partition so that a fluid-tight closure is formed about the insulating material 29 and 53 of the food storage compartment 43, which closure comprises the outer panel 12 of the door 10, the frame 14, the gasket 19, the outer shell 41 of the food storage compartment 43, and the partition.

It will be apparent from the above that this invention provides a strong and fluid-tight door construction at the point of securement of the door hinges. It further provides a door hinging construction of pleasing external appearance.

While I have shown the invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and it is desired, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In a refrigerator door and hinge securement therefor, the combination of an outer dished panel having inwardly-bent edges lying in one plane with the exception of at least one depressed portion of said edges, said depressed portion lying parallel to said plane and being adapted for securement of a hinge plate, a flat frame secured in fluid-tight engagement with said inwardly-bent edges lying in one plane and extending inwardly beyond said edges, said frame being spaced from the depressed portion and a sealing plate underlying and contiguous with said depressed portion, said sealing plate extending sidewardly and inwardly of said depressed portion, said sideward extension being deformed to lie contiguously to the adjacent edge portions lying in said one plane and said inward extension being deformed to lie contiguously to the adjacent portion of said frame, said plate being secured in fluid-tight engagement to the depressed portion and to the portions of the edges and the frame to which it is contiguous, thereby forming a fluid-tight closure for the space between the depressed portion and the portion of the frame adjacent thereto.

2. In a refrigerator door and hinge securement therefor, the combination of an outer dished panel having inwardly-bent edges lying in one plane with the exception of at least one depressed portion thereof adapted for securement of a hinge plate, said depressed portion lying parallel to said plane, a frame comprising a flat portion secured in fluid-tight engagement with said inwardly-bent edges, said flat portion being spaced from the depressed portion, said frame comprising also an inward extension and a portion at said inward extension bent at an angle to said flat portion to stiffen said frame, and a sealing plate underlying and contiguous with said depressed portion, said sealing plate extending sidewardly and inwardly of said depressed portion, said sideward extension being deformed to lie contiguously to the adjacent edge portions lying in one plane and said inward extension being deformed to lie contiguously to the adjacent flat portion of said frame, said plate being secured in fluid-tight engagement to the depressed portion and to the portion of the edges and the frame to which it is contiguous, thereby forming a fluid-tight closure for the space between the depressed portion and the flat portion of the frame adjacent thereto.

3. In a refrigerator door and hinge securement therefor, the combination of an outer dished panel having inwardly-bent edges lying in one plane with the exception of at least one depressed portion of said edges, said depressed portion lying parallel to said plane, a flat hinge plate located in said depressed portion, the thickness of said plate being substantially equal to the depression of said portion, a flat frame secured in fluid-tight engagement with said inwardly-bent edges lying in one plane and extending inwardly beyond said edges, and a sealing and reinforcing plate underlying and contiguous with said depressed portion, said sealing and reinforcing plate extending sidewardly and inwardly of said depressed portion, said sideward extension being formed to lie contiguously to the adjacent edge portions lying in one plane and said inward extension being deformed to lie contiguously to the adjacent portion of said frame, said sealing and reinforcing plate being secured in fluid-tight engagement to the depressed portion and to the portions of the edges and of the frame to which it is contiguous, thereby forming a fluid-tight structure between the hinge plate and the interior of the door, and means for securing said hinge plate to said sealing and reinforcing plate.

4. In a refrigerator door and hinge securement therefor, the combination of an outer dished panel having inwardly-bent edges lying in one plane with the exception of at least one depressed portion of said edges lying parallel to said plane, a flat hinge plate located in said depressed portion, the thickness of said plate being substantially equal to the depression of said portion, a flat frame secured in fluid-tight engagement with said inwardly-bent edges lying in one plane and extending inwardly beyond said edges, and a sealing and reinforcing plate underlying and contiguous with said depressed portion, said sealing and reinforcing plate extending sidewardly and inwardly of said depressed portion, said sideward extension being formed to lie contiguously to the adjacent edge portions lying in one plane and said inward extension being deformed to lie contiguously to the adjacent portion of said frame, said plate being secured in fluid-tight engagement to the depressed portion and to the portion of the edges and the frame to which it is contiguous, forming a fluid-tight structure between the hinge plate and the interior of the door, means for securing said hinge portions to said sealing and reinforcing plate and a resilient and an imperforate sealing gasket secured in fluid-tight engagement with one of the flat surfaces of the frame.

5. In a refrigerator door and hinge securement therefor, the combination of an outer dished panel having inwardly-bent edges lying in one plane with the exception of at least one depressed portion of said edges lying parallel to said plane, a flat hinge plate located in said depressed portion, the thickness of said plate being substantially equal to the depression of said portion, a flat frame secured in fluid-tight engagement with said inwardly-bent edges lying in one plane and extending inwardly beyond said edges, and a sealing and reinforcing plate underlying and contiguous with said depressed portion, said sealing and reinforcing plate extending sidewardly and inwardly of said depressed portion, said sideward extension being formed to lie contiguously to the adjacent edge portions lying in one plane and said inward extension being deformed to lie contiguously to the adjacent portion of said frame, said plate being secured in fluid-tight engagement to the depressed portion and to the portion of the edges and the frame to which it is contiguous, forming a fluid-tight structure between the hinge plate and the interior of the door, means for securing said hinge portions to said sealing and reinforcing plate, an inner door panel of thin, non-metallic material comprising broad, smooth edge portions lying adjacent the flat surface of said frame, a resilient, impervious sealing gasket comprising a flat attachment flange lying between said edge portion of the inner door panel and the flat surface of said frame, and means for securing the edge portions of the inner panel to the frame to clamp said attachment flange therebetween thereby providing a fluid-tight seal between the attachment flange and the frame.

6. In a door for a refrigerator cabinet, the combination of an outer dished panel, inwardly-extending flanges on the edges of said panel having at least one depressed portion therein, said

flanges, with the exception of said depressed portion, lying in one plane, a hinge plate in said depressed portion, a flat frame secured in fluid-tight engagement with the outer surface of said flange with the exception of the depressed portion thereof, said frame extending beyond the inner edge of said flange, a sealing plate underlying said flange and extending therebeyond, said sealing plate being secured in fluid-tight engagement to said frame, to said depressed portion, and to the portion of the flange lying adjacent to the depressed portion thereof, and a sealing gasket on the outer surface of said flat frame, said sealing gasket, frame, sealing plate, and dished panel forming a fluid-tight wall.

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