

March 28, 1944.

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2,345,387

METHOD OF TESTING REFRIGERATOR CABINETS

Filed May 20, 1941

2 Sheets-Sheet 1

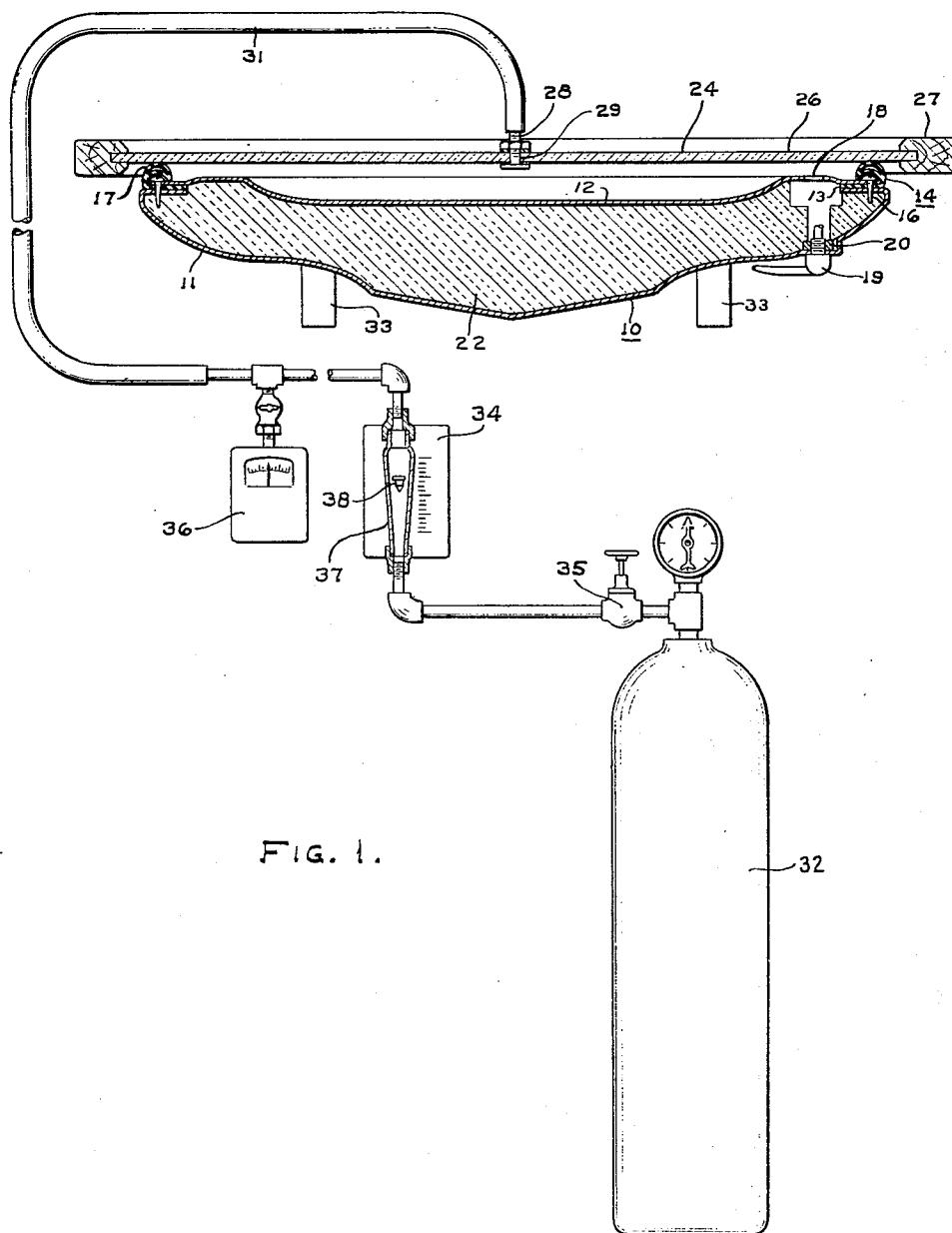


FIG. 1.

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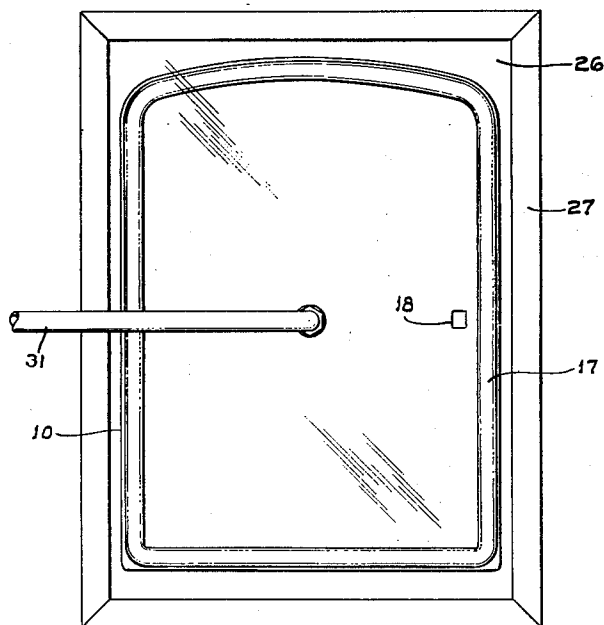


FIG. 2.

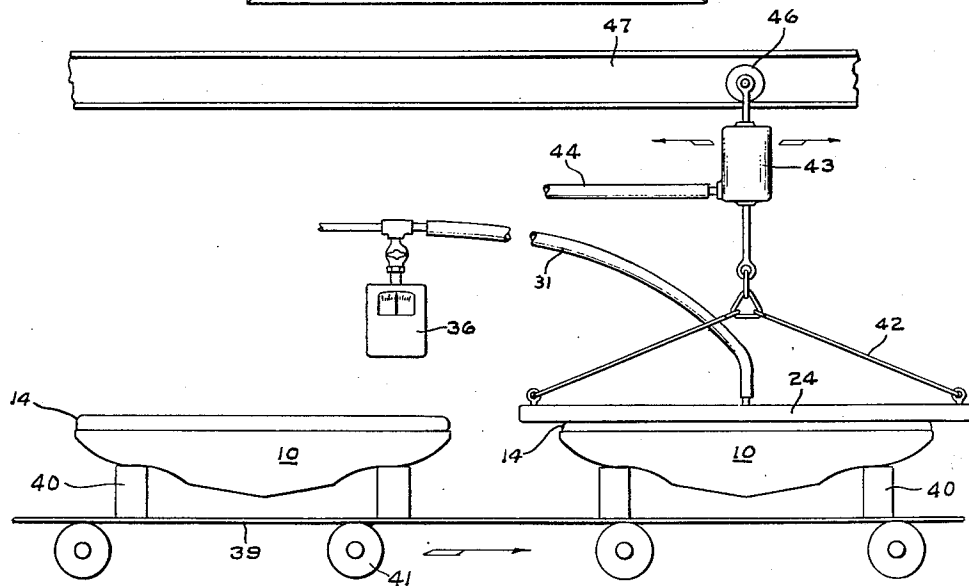


FIG. 3.

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METHOD OF TESTING REFRIGERATOR
CABINETS

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Application May 20, 1941, Serial No. 394,277

4 Claims. (Cl. 73—51)

This invention relates to methods of testing refrigerator cabinet structures, for example, refrigerator doors, and more especially to a method of testing such structures for air tightness.

The outer shell of a refrigerator should be substantially air tight to prevent the relatively moist air ambient the refrigerator from circulating through the wall structure and depositing its moisture by condensation therein. This applies equally well to the door structure of the refrigerator. The outer shell of a refrigerator is not designed to withstand high air pressures so that the ordinary methods of testing for air leakage are not adapted for this work.

One object of the invention is to provide an accurate method for testing the fluid-tightness of the wall elements of refrigerator structures.

Another object of the invention is to provide a method of testing the fluid-tightness of chambers having walls not adapted to withstand high fluid pressures;

A further object is to provide a method for testing the fluid-tightness of the wall elements of refrigerator structures which method can be performed by semi-skilled labor.

Still a further object of the invention is to provide a method for testing the fluid-tightness of wall elements of refrigerator structures on a moving conveyor.

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

Fig. 1 is a schematic drawing showing the apparatus for testing a refrigerator door and a section of a door being tested by said apparatus;

Fig. 2 is a plan view of the door and the testing frame positioned thereon; and,

Fig. 3 is a schematic drawing of a refrigerator door being tested on a moving conveyor.

Referring to the drawings for a detailed description of the invention, the reference numeral 10 designates a door of a refrigerator such as described in the Patent No. 2,307,094 to Orland H. Yoxsimer and assigned to the assignee of this invention. The door 10 comprises an outer panel 11 formed of sheet steel and an inner panel 12. The marginal portions of the outer panel are bent inwardly and a flange 13 of a sealing gasket 14 is interposed between the marginal portions of the outer panel 11 and the inner panel 12. Screws 16 pass through the marginal portions of the inner panel, through the flange 13 of the

gasket 14 and into the marginal portion of the outer panel 11 to hold the door structure together.

The sealing gasket 14 comprises a tubular portion 17 which is adapted to contact the wall of a refrigerator cabinet about its door opening to effect a substantially air-tight engagement with the wall. A refrigerator cabinet suitable for use with the door 10 is shown in the Patent No. 2,213-155, granted to O. H. Yoxsimer on August 27, 1940. A hole 18 is formed in the inner panel for accommodating the latch strike of the refrigerator and a door handle 19 passes through a sealing gland 20 in the outer panel 11 for actuating the latch mechanism (not shown) in the interior of the door. Loose heat-insulating material 22 is located in the space between the outer panel 11 and the inner panel 12.

To test the air tightness of the outer wall of the door 10 including the gasket 14 and the seal 20 in accordance with this invention, the door 10 is placed horizontally on supports 33 with the inner panel 12 facing upwards and a plate 24, comprising a sheet of glass 26 surrounded by an outer frame 27, is placed on the door with the glass 26 resting on the gasket 14. The plate 24 is of such weight that the pressure on the gasket 14 is equal to that placed on the gasket 14 when the door is in actual service on the refrigerator.

A nipple 28 passes through a hole 29 in the center of the sheet 26, which nipple 28 is connected through a flexible hose 31 and other apparatus subsequently to be described with a cylinder 32 containing a gas under high pressure. A suitable gas for this purpose is oxygen because cylinders of dry oxygen at high pressures are readily available. The other apparatus interposed between the nipple 28 and the cylinder 32 are a needle valve 35, a flow meter 34 and a pressure gauge 36. The flow meter 34 is of the type known by the trade mark "Rotameter" and comprises a tapered tube 37 and a metering rotor 38 which indicates the rate of flow of gas through the flow meter.

In testing a door the needle valve 35 is opened sufficiently to permit a predetermined flow of oxygen to pass through the hose 31, the rate of flow being measured by the metering rotor 38. The plate 24 is thereupon placed on the door 10 and the rate of pressure rise in the sealed space is noted on the meter 36. It will be obvious that the oxygen escaping from the cylinder 32 passes through the nipple 28 into the space between the glass plate 26 and the door 10 and through the

opening 18 into the interior of the door 10. If a leak exists anywhere in the wall of the door which is exposed to the ambient atmosphere, the pressure registered by the pressure gauge 36 will not increase as fast as if the outer wall of the door 10 were fluid-tight.

Since the pressure of the gas in cylinder 32 is very high in comparison to the pressure of the gas at which the door is being tested, the rate of flow will remain practically constant regardless of the fluid-tightness of the door wall. Consequently the pressure increase indicated by the meter 36 is substantially proportional to the air-tightness of the outer wall of the door. A standard may therefore be set for each type of door which the door must meet in order to pass the test. In actual practice, it has been found expedient merely to set a minimum pressure which must be attained within a reasonable time.

The structure of the door 10 is not capable of withstanding high pressures, and, therefore, very low pressures and a very low flow of gas must be used. In actual practice it has been found expedient to use a rate of flow of the gas through the tube 31 of three-fourths of a cubic foot per hour and to limit the pressure admitted to the door to one-tenth of an inch of water in testing a door for a domestic refrigerator. When this pressure is indicated by the pressure gauge 36, the plate 24 is lifted or the valve 35 closed.

Fig. 3 shows the arrangement of the apparatus for testing doors on a moving conveyor. In this figure, the reference numeral 39 indicates a conveyor which moves continuously to the right. The conveyor 39 is provided with supports 40 which carry the doors 10 to be tested. The plate 24 is supported by rods 42 and a pneumatic hoist 43 which is actuated by compressed air through a hose 44. The hoist 43 in turn is supported by a monorail conveyor 46 on a rail 47 so that the plate 24 can be moved back and forth over the conveyor platform 39.

The testing operation is performed as follows: A uniform rate of oxygen flow is established through the hose 31 as previously described. The plate 24 is then lowered by means of the hoist 43 on the door 10 to be tested and moves along with the conveyor 39. During this time the plate 24 drags the hoist 43 along with it. As soon as the plate 26 contacts the gasket 14 and makes a sealing engagement therewith, the meter 36 rises and if the rate of rise is found to be satisfactory, or if the required pressure of one-tenth of an inch water is reached within a reasonable length of time, the hoist 43 is actuated to lift the plate 24. The hoist 43 and plate 24 are thereupon moved back along the rail to the next door to be tested and the plate 24 is lowered thereon. If the rate of rise or the maximum pressure attained is unsatisfactory, the sealing of the gasket 14 against the glass sheet 26 is inspected and the door 10 thereafter removed from the conveyor 39 and marked as to the defects discovered so that repairs can be made.

In actual practice, the operators on the conveyor merely watch the pressure gauge 36 to see that the minimum pressure of one-tenth of an inch of water is attained within a reasonable length of time and use the travel of the conveyor 39 as a timing device to determine the reasonable length of time.

Since the testing of the doors on the conveyor requires only the lowering of the testing plate 24

thereon, the watching of a simple gauge, and the subsequent raising and moving of the plate 24 and hoist 43, the testing can be done by semi-skilled labor.

It will be obvious from the above that this invention provides an accurate test of fluid-tightness of a wall of a refrigerator structure which structure is not adapted to withstand high fluid pressures. The invention further provides a method for testing the fluid-tightness of refrigerator structure on a movable conveyor, which tests can be performed by semi-skilled labor.

While I have shown my 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 I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. The method of testing the fluid-tightness of a wall element of a refrigerator, said wall being encircled by a gasket, said method comprising placing an imperforate and transparent plate in sealing engagement with said gasket, forcing a fluid at a predetermined rate into the space defined by said plate, wall, and gasket, observing the seating of said gasket against said plate by a visual inspection through said plate, and determining whether the pressure in said space rises above a predetermined standard.

2. The method of testing the fluid-tightness of a wall element of a refrigerator, said wall being encircled by a gasket, said method comprising placing an imperforate and transparent plate in sealing engagement with said gasket, forcing a fluid at a predetermined rate into the space defined by said plate, wall, and gasket, observing the seating of said gasket against said plate by a visual inspection through said plate, determining the rate of pressure rise in said space, and comparing said rate with a predetermined standard.

3. The method of testing the fluid-tightness of a wall of a refrigerator door, said refrigerator door comprising a substantially imperforate outer panel, a perforate inner panel and a gasket at the marginal edges of the inner panel, said method comprising placing the door in a position with the gasket facing upwardly, placing a weighted plate in sealing engagement with said gasket and forcing a fluid at a uniform rate into the space between said plate, the inner panel, and said gasket, said fluid passing through said perforate inner panel into said door, and determining whether the pressure in said space rises above a predetermined standard.

4. The method of testing the fluid-tightness of a wall of a refrigerator door, said refrigerator door comprising a substantially imperforate outer panel, a perforate inner panel and a gasket at the marginal edges of the inner panel, said method comprising placing the door in a position with the gasket facing upwardly, placing a weighted and transparent plate in sealing engagement with said gasket and forcing a fluid at a uniform rate into the space between said plate, the inner panel, and said gasket, said fluid passing through said perforate inner panel into said door, inspecting the sealing engagement of said gasket with said transparent plate by looking through the same, and determining whether the pressure in said space rises above a predetermined standard.

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