

March 28, 1967

A. R. COSTANTINI ETAL

3,311,045

VENT BREATHER FOR REFRIGERATOR

Filed Oct. 13, 1964

FIG. 1

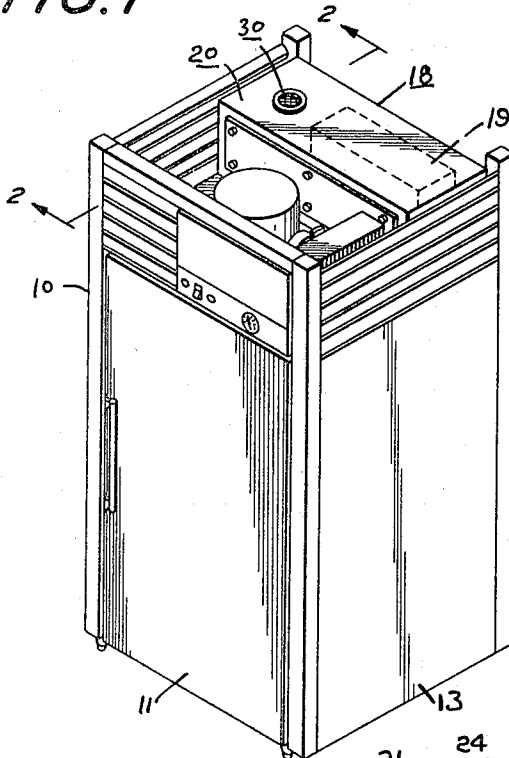


FIG. 3

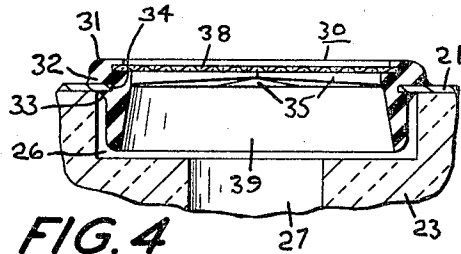
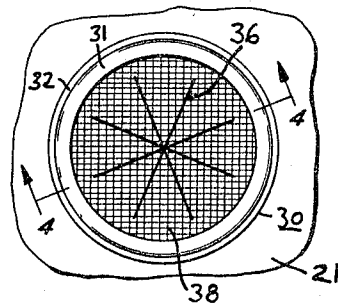


FIG. 4

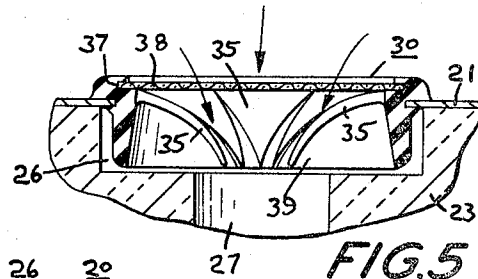


FIG. 5

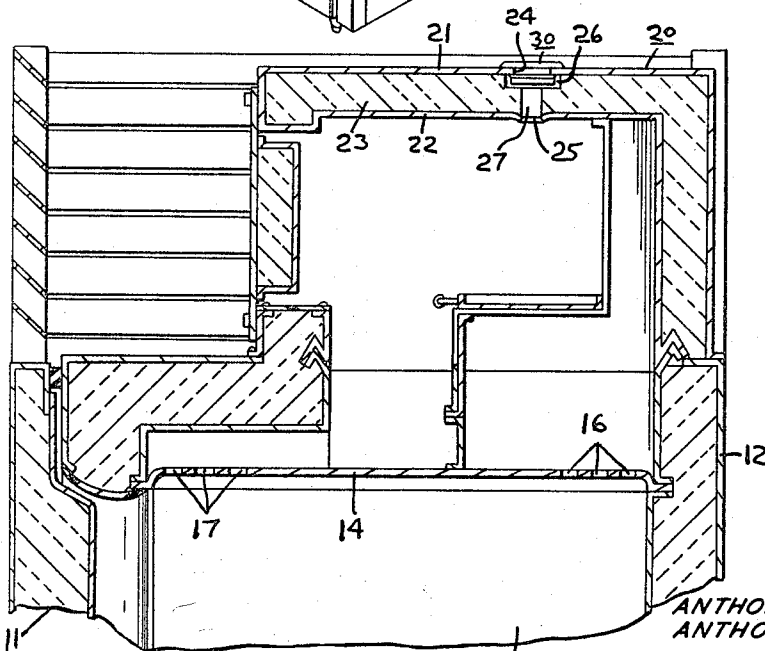
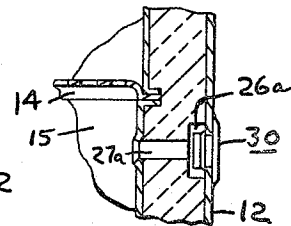


FIG. 2

FIG. 6



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VENT BREATHER FOR REFRIGERATOR

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Filed Oct. 13, 1964, Ser. No. 403,617

3 Claims. (Cl. 98—51)

This invention relates generally to refrigerator and freezer constructions hereinafter referred to generally by the term refrigerator, and more particularly relates to a refrigerator breather or pressure equalizing device.

As is well known, air contracts volumetrically when cooled and expands when heated. Since refrigerator structures are designed to cool air to temperatures usually below 40° F., and since the ambient air temperature is usually on the order of 70° F. or higher it will be appreciated that normal usage of refrigerators permits cooled air to escape from the refrigerated compartment and permits warm air to enter therein due to the openings and closings of the refrigerator doors. Each time the refrigerator is opened and a certain volume of cooled air escapes and is replaced by an equal volume of warm room air. The warm room air admitted to the interior of the refrigerator compartment is subsequently cooled and therefore is caused to undergo a volume contraction resulting in a decrease of pressure inside the refrigerator compartment. The drop in pressure of the refrigerator interior as compared with the atmospheric ambient pressure external to the refrigerator results in a net force being exerted on the refrigerator door which forces the door more firmly into its closed position and makes it somewhat difficult to open when desired. Accordingly, it is a primary object of our invention to provide a novel pressure relief device for refrigerators which acts automatically to equalize the pressure inside of a refrigerated compartment with that existing outside so that subsequent opening of the door to the refrigerator is not rendered difficult due to a pressure differential.

Another object of our invention is to provide a novel pressure equalizing device for refrigerators as aforesaid which is simple in construction, inexpensive in manufacture, trouble free in use, unobtrusive in appearance and simple to install.

A further object of our invention is to provide a novel pressure equalizing device for refrigerators utilizing a plurality of interengaging resilient fingers automatically moveable to provide an opening under conditions of a pressure differential thereacross in one sense, while remaining interengaged in a closed position when subjected to a pressure differential thereacross in the opposite sense.

The foregoing and other objects of our invention will appear more fully hereinafter from a reading of the following specification in conjunction with an examination of the appended drawings, wherein:

FIGURE 1 is a perspective view of a refrigerator having incorporated therein the pressure equalizing device of the present invention;

FIGURE 2 is a fragmentary enlarged vertical section taken through the upper region of the refrigerating apparatus shown in FIGURE 1, as would be seen when viewed along the line 2—2 of FIGURE 1;

FIGURE 3 is an enlarged top view of the pressure equalizing breather device constructed in accordance with the principles of the present invention;

FIGURE 4 is an enlarged vertical cross-sectional view through the pressure equalizing breather device as would be seen when viewed along the line 4—4 of FIGURE 3;

FIGURE 5 is a view of the breather device of FIG-

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URE 4 illustrating in an exaggerated manner depression of the resilient fingers of the breather device due to a pressure differential thereacross resulting from pressure decrease in the interior of the refrigerated cabinet; and

FIGURE 6 illustrates the pressure equalizing breather device alternatively mounted in a vertical wall of a refrigerator instead of on the top wall thereof.

In the several figures, like elements are denoted by like reference characters.

Briefly, the objects of the invention are accomplished by providing a one way venting device which interconnects the inside of the refrigerator with the ambient atmosphere only when the pressure within the refrigerator drops below that of the outside atmosphere so as to exert a closing force on the refrigerator door if unrelieved. The vent thus permits air to be drawn into the refrigerated compartment but does not permit air to be expelled therethrough out of the compartment. While the vent may be located at any convenient region, in general the optimum placement is toward the upper end of the refrigerated compartment to minimize the possibility of heat transfer therein.

Referring now to the drawings and more particularly to FIGURES 1 and 2 it will be observed that the device of the present invention is shown incorporated, for purposes of illustration, in a refrigerator 10 of the type having an openable and closable front door 11, a rear wall 12, and side walls 13 which together with a top liner define a refrigerated storage compartment 15. The top liner 14 is provided proximate its rear end with a plurality of inlet openings 16, and is similarly provided proximate its front end with a plurality of outlet openings 17. A penthouse 18 extends upward above the refrigerated compartment top liner 14 and normally contains the cooling coil portion of the refrigerator apparatus and blower means for circulating air over the cooling coils downward into the refrigerated compartments through the inlet opening 16 and then back outward through the outlet openings 17, the cooling coil 19 being shown in phantom in FIGURE 1, while being omitted from the showing of FIGURE 2 for purposes of clarity. The top wall 20 of the penthouse 18 is illustrated in FIGURE 2 as being formed by vertically spaced parallel panels 21 and 22 to define therebetween an intervening space which is filled with foamed plastic or other suitable insulation material 23. As is best seen in the showing of FIGURE 2, the panels 21 and 22 are respectively apertured as at 24 and 25 and the intermediate insulation 23 is cored out as at 26 and 27 to provide a vertically extending duct through the top wall 20 of the penthouse, which duct, may be of any convenient cross-sectional shape adequate to receive and accommodate therein the venting device of the present invention designated generally as 30.

As shown in FIGURE 2, the outer side of the venting device 30 communicates with the ambient atmosphere external of the refrigerator, while the opposite or inner of the venting device communicates with the interior of the refrigerated compartment through the penthouse. Alternatively, as shown in the detail of FIGURE 6, the venting device 30 could be disposed in the rear wall 12 of the refrigerator for communication directly with the compartment 15 via the cored-out ducts 26a and 27b. Similarly, the venting device could be installed in any other of the compartment side walls 13, or even in the compartment door 11 itself.

FIGURES 3, 4 and 5 illustrate the structural configuration of the venting device together with its mode of operation. As these figures show, the main body 31 of the venting device is in the form of a grommet-like member, preferably integrally molded or otherwise formed of rub-

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ber or other resilient material, having spaced marginal lips 32 and 33 which define therebetween a peripherally extending groove or recess 34 adapted to receive therein the marginal edges of the top aperture 24 formed in the panel 21 of the refrigerator, and an openable and closable seal in the form of a suitably slitted membrane or web extending transversely across the central opening of the grommet 31.

This central membrane or web, which is preferably formed as an integral part of the main body portion 31 of the venting device, is radially slit outwardly from its center along the lines 36 to provide a plurality of wedge-shaped flexible vanes 35 which normally assume a coplanar relation as shown in FIGURE 4 with their side edges abutting one another to effectively close off any passage of air through the center of the venting device.

Also formed in the grommet portion 31 immediately adjacent the outer surface of the vanes 35 is an internal groove 37 for receiving and holding in secured position a reticulated screen 38 disposed in closely adjoining parallel relation to the vanes 35 of the slitted membrane.

The screen 38 prevents the vanes 35 from opening outward under conditions where the gas pressure on the screen side of the vanes is less than that on the opposite or inner of the vanes. However, as clearly seen in FIGURE 5, the central or pointed region of each of the flexible vanes 35 is susceptible to inward movement under circumstances where the gas pressure on the screen side of the vanes is greater than that present on the opposite or inner side of the vanes. This latter condition occurs as hereinbefore described when cold air escapes from the refrigerated compartment and is replaced with warm air which is subsequently cooled and reduced in volume to thereby reduce the pressure in the refrigerated compartment to a value below that of the atmosphere surrounding the refrigerator. In practice, of course, the vanes 35 will not depress to the full extent shown in FIGURE 5, but will open downward just sufficiently to allow enough outside air to enter the refrigerator to effect the desired substantial pressure equalization.

Rigidification of the venting device 30 is provided by the hollow cylindrical portion 39 which extends downward from the grommet 31 as a coaxial integral extension thereof. While the extension 39 is sufficiently rigid to resist rim deformation of the grommet portion 31 and thereby insure that the vanes 35 are enabled to move into their closed position as shown in FIGURE 4, it is nevertheless resilient enough to enable the device to be projected downward into the top aperture 24 through the case top 21 to permit the aperture defining edges of the case top to seat into the external annular recess 34 of the grommet portion 31. Of course, any other means may be provided for operatively securing the venting device of the present invention in registry with a passage suitably extending through a refrigerator wall for affecting communication between the interior of the refrigerator compartment and the atmosphere external of the refrigerator.

Having now described our invention with respect to a particularly illustrated embodiment thereof, it will be appreciated that modifications and variations of our invention may now occur from time to time to those persons normally skilled in the art without departing from the essential scope or spirit of the invention, and accordingly it is intended to claim the same broadly as well as specifically as indicated by the appended claims.

What is claimed as new and useful is:

1. A vented refrigerator structure comprising in combination:

- (a) a refrigerator having a cooled storage compartment with an access door thereto by means of which articles to be cooled may be placed into and removed from the compartment,
- (b) a duct extending transversely through one wall of said refrigerator with the inner end of said duct in

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atmospheric communication with said storage compartment and with the outer end of said duct being openable to the atmosphere external to said refrigerator through a venting device, and

- (c) a pressure responsive venting device across said duct carried by said one wall of said refrigerator, said venting device including pressure responsive means effective to automatically open said duct to atmosphere only whenever the internal pressure in said storage compartment drops below the atmospheric pressure external to said refrigerator and to otherwise close said duct against air flow between said storage compartment and said atmosphere.

2. A vented refrigerator structure comprising in combination,

- (a) a refrigerator having a cooled storage compartment with an access door thereto by means of which articles to be cooled may be placed into and removed from the compartment,
- (b) a duct extending transversely through one wall of said refrigerator with the inner end of said duct in atmospheric communication with said storage compartment and with the outer end of said duct being openable to the atmosphere external to said refrigerator through a venting device, and
- (c) a pressure responsive venting device mounted in said one wall of said refrigerator to extend across said duct, said venting device having a central passage normally closed by a plurality of contiguous flexible vanes disposed in a plane orthogonal to said passage, said vanes being respectively supported to provide portions which are movable out of said plane to thereby automatically open said duct to atmosphere when said vanes are subjected to a higher pressure on the side thereof facing the atmosphere external to said refrigerator and to otherwise close said duct.

3. A vented refrigerator structure comprising in combination,

- (a) a refrigerator having a cooled storage compartment with an access door thereto by means of which articles to be cooled may be placed into and removed from the compartment,
- (b) a duct extending transversely through one wall of said refrigerator with the inner end of said duct in atmospheric communication with said storage compartment and with the outer end of said duct being openable to the atmosphere external to said refrigerator through a venting device, and
- (c) a pressure responsive venting device disposed across said duct having a peripherally extending supporting rim carried by said one wall of said refrigerator, a plurality of contiguous wedge-shaped flexible resilient vanes, said vanes being thin relative to their radial length and disposed with their pointed ends extending radially inward toward one another and converging at the longitudinal axis of said duct, the broad outer ends of said wedge-shaped vanes being secured to said supporting rim, and the side edges of each wedge-shaped vane continuously engaging the side edges of the contiguous adjacent wedge-shaped vanes to thereby close the duct cross-section, at least said pointed ends of said vanes being axially shiftable away from one another to open said duct cross-section whenever the atmospheric pressure in said storage compartment drops below the atmospheric pressure external to said refrigerator and a substantially rigid gas-pervious member carried by said supporting rim and disposed across said duct immediately adjacent to all of said vanes on the external atmosphere side of the latter, said rigid member being effective to prevent said vanes from moving axially away from one another to open said duct when the atmospheric pressure in said storage compartment

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risers above the atmospheric pressure external to said refrigerator.

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