April 14, 1959 R. E. LINDENSCHMIDT 2,882,115

VACUUM RELEASE MECHANISM

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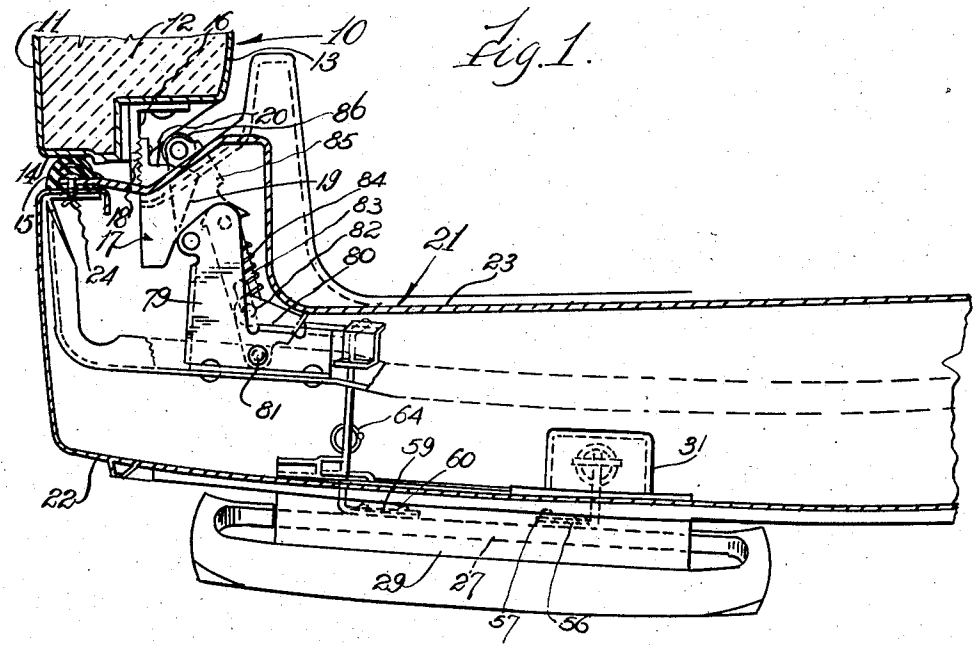


Fig. 1.

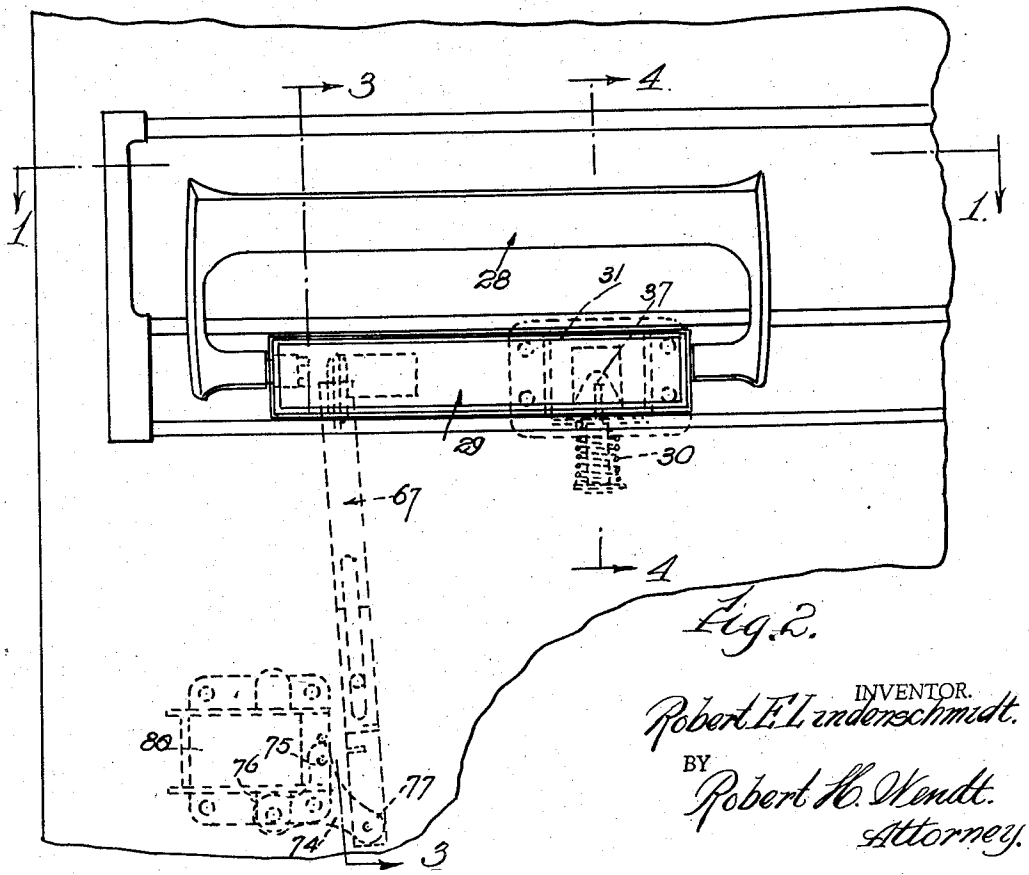


Fig. 2.

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Fig. 3.

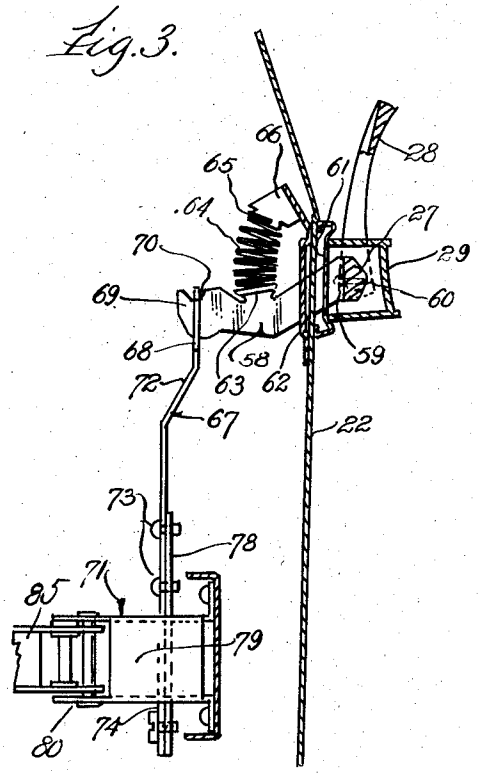


Fig. 4.

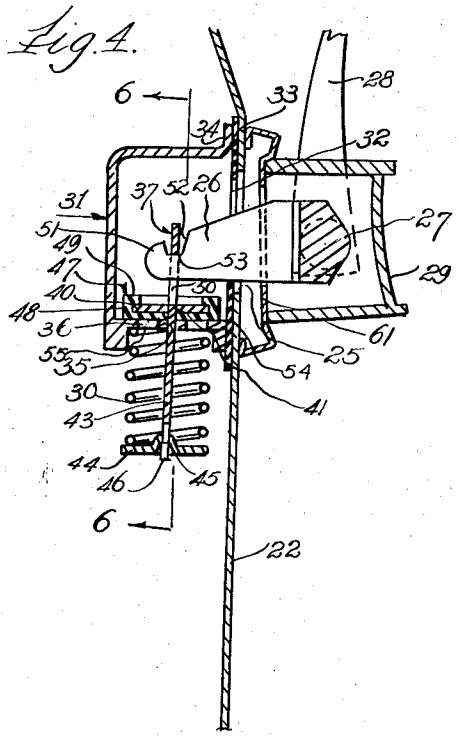


Fig. 5.

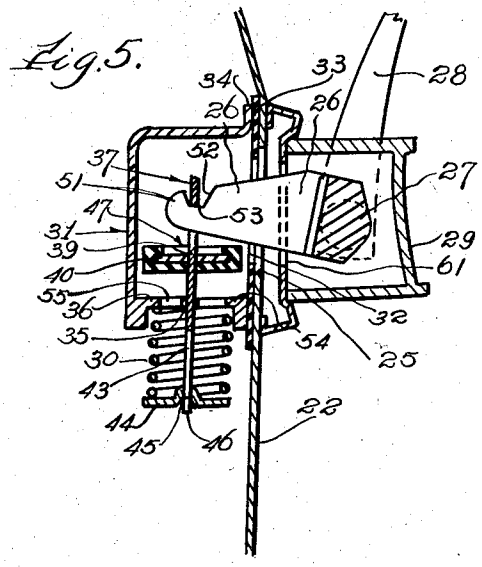
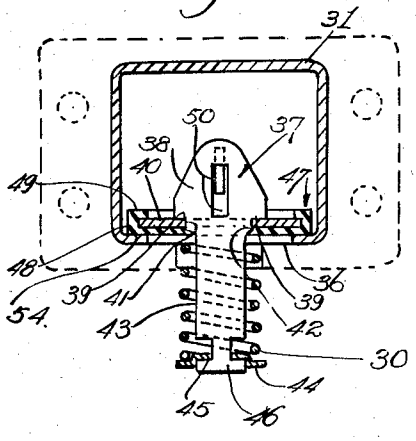


Fig. 6.



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2,882,115

VACUUM RELEASE MECHANISM

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Application November 20, 1957, Serial No. 697,611

12 Claims. (Cl. 312—296)

The present invention relates to vacuum release mechanism for refrigerator cabinets, and is particularly concerned with the provision of an improved vacuum release mechanism which equalizes inside and outside pressures quickly to allow the door to be reopened immediately with greater ease after closing, when the freezer or refrigerator is operating.

One of the objects of the invention is the provision of an improved vacuum release mechanism, which is adapted to be operated in a direction at 90° or transversely to the handle operating lever, which may also be adapted to actuate a door latch.

Another object of the invention is the provision of an improved vacuum release mechanism in which the vacuum release mechanism is enclosed in a special sealed chamber inside the door, so that the door latch mechanism and the actuating mechanism for the vacuum release may be connected by linkage, and only a single lever is required to pass through the door.

Another object of the invention is the provision of an improved vacuum release mechanism, which is adapted to be used separately for releasing the vacuum or in conjunction with a door latch that is actuated by a handle which may also control the vacuum release.

Another object of the invention is the provision of an improved vacuum release mechanism which is simple in construction, capable of economical manufacture, which includes a minimum number of parts, which is adapted to be used for a long period of time without necessity for repair or replacement of its parts, and which is adapted to be used in conjunction with various types of door latches.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings in which similar characters of reference indicate similar parts throughout the several views.

Referring to the drawings accompanying this specification, of which there are two sheets,

Fig. 1 is a horizontal sectional view taken through a cabinet and refrigerator door on the plane of the line 1—1 of Fig. 2, looking in the direction of the arrows;

Fig. 2 is a fragmentary elevational view taken from the bottom of Fig. 1;

Fig. 3 is a fragmentary sectional view taken on the plane of the line 3—3 of Fig. 2, looking in the direction of the arrows;

Fig. 4 is a fragmentary sectional view taken on the plane of the line 4—4 of Fig. 2, looking in the direction of the arrows;

Fig. 5 is a fragmentary sectional view similar to Fig. 4, with the parts in the position which they assume when the vacuum release valve is open;

Fig. 6 is a fragmentary sectional view taken on the plane of the line 6—6 of Fig. 4, looking in the direction of the arrows.

Referring to Figs. 1 and 2, 10 indicates in its entirety the cabinet of a refrigerator or freezer of the type including a refrigeration system for cooling the interior of one or more chambers, and having an insulated door hingedly mounted on one side of a door opening.

The cabinet includes an outer shell 11, separated by insulation 12, from inner liner 13, and the outer shell 11 has a facing flange 14 for engagement with a door seal 15.

The cabinet supports an angle bracket 16, which is adapted to support a door strike 17 for adjustment by means of a plurality of threaded members 18.

The door strike 17 usually has a beveled camming surface 19 and a curved latch retaining shoulder 20. The door, indicated in its entirety by 21, comprises an outer shell 22 and an inner panel 23, secured together by threaded members 24, the heads of which are concealed under the door seal, and the door seal 15 extends all around the edge of the door for effecting an air-tight closure against the facing flange 14 of the cabinet to prevent loss of cold air or entrance of warm air.

The operation of the refrigeration system cooling the air inside the cabinet tends to cause a lower pressure inside the cabinet, and it is this differential of pressure between the inside and the outside that is to be released by the vacuum release mechanism to permit the door to be opened more easily.

The vacuum release mechanism is preferably carried on the inside of the outer shell 22 of the door adjacent the handle that is used for opening the door.

The preferred form of vacuum release mechanism is shown in Figs. 4, 5 and 6, in which the outer shell 22 has an aperture 25 for passing the lever 26 that actuates the vacuum release.

The lever 26 may be fixedly secured to a shaft 27, forming a part of the door handle 28, which is pivotally mounted in the door handle escutcheon 29, that is mounted on the outside of the outer shell 22 of the door.

Handle 28 extends upwardly from the shaft 27 and is held in upward position by the compression of the spring 30, forming part of the vacuum release mechanism.

The vacuum release mechanism is mounted in a rectangular housing 31 of box-like shape, having a slot 32 in a gasket 33, which is compressed between the attaching flanges 34 and the inside of the outer shell 22.

The housing 31 has an elongated aperture or slot 35 in its bottom wall 36 for passing the valve rod 37, which may be in the shape of a flat plate, shown in Fig. 6. Valve rod 37, Fig. 6, has a wider head 38, thus providing it with a pair of shoulders 39 for engaging the top of the valve plate 40, having an elongated slot 41 for passing the valve rod 37.

Valve rod 37 is riveted over at 42 to secure the plate 40 to the valve rod 37, adjacent its head, and valve rod 37 has an elongated shank 43, serving as a support for the compression spring 30.

Compression spring 30 engages the bottom of the bottom wall 36 at its upper end and engages a valve seat plate 44 at its lower end.

Valve seat plate 44 may have a pressed groove 45 to receive the T shaped head 46; and valve seat plate 44 is circular to engage the spring 30. Valve seat plate 44 may have an elongated slot transverse to the groove 45 for passing the T shaped head 46, after which the valve plate 44 is turned 90° to register shank 43 with the groove 45.

The valve plate 40 carries a soft, rubber valve gasket 47 which is rectangular in shape and has an upwardly extending edge wall 48 and the inner extending retaining flange 49. Flange 49 is adapted to extend over the latch valve plate 40, and is resilient so that it may be curled back to insert the valve plate or to remove the valve plate.

The valve rod 37 has an elongated slot or aperture 50 at its upper end in the head 38, and the aperture 50 is long enough to pass the head 51, located on lever 26, beyond the tapered groove 52.

Tapered groove **52** has a wide bottom **53**, permitting a sliding motion between the valve rod **37** and lever **26**, as the lever pivots, because the lever is pivoted on a fixed axis and the valve rod **37** slides longitudinally.

Groove **52** is tapered to provide sufficient clearance between the walls of this groove and the valve rod **37**. The spring **30** tends to pull the valve plate **40**, with its gasket **47**, downward against a flat seat **54**, surrounding a plurality of apertures **55** in the bottom wall **36**.

The gasket **47** is adapted to close these apertures due to the action of the spring **30**, but a pull on the handle **28** toward the right in Fig. 4 tends to open the door and pivots the lever **26** clockwise to the position of Fig. 5.

Thus a pull on the handle may first open the vacuum release valve and relieve any pressure that tends to hold the door closed. The lever **26** may be secured to the shaft **27** by having an angular attaching flange **56** and rivets **57** passing through this flange and through the shaft **27**.

In some embodiments of the invention, handle **28** may actuate only the vacuum release mechanism in cabinets, such as, for example, those which have no latch other than a magnetic latch.

The same handle **28**, however, may also be connected to actuate a latching mechanism of the type employed for latching refrigerator or freezer doors.

For this purpose the shaft **27** may support a lever **58**, Fig. 3, by means of an angular attaching flange **59** and rivets **60** passing through the shaft **27**.

The escutcheon plate **29** may be in the form of an elongated housing providing bearings for the shaft **27** of the handle in escutcheon plate **29** and may clamp a plate **61** against the outside of the shell **22** and also plate **62** against the inside of the shell **22** by means of suitable threaded members.

The lever **58** passes through slots or elongated apertures in plate **61**, shell **22** and plate **62**. Lever **58** may be provided intermediate its ends with a backwardly beveled spring-supporting head **63**.

The spring supporting head **63** is slightly larger than the inside of the helical spring **64**, which is forced over the head to be secured on it. The other end of the spring is forced over a similar head **65**, carried by a backwardly extending angular portion **66** of the plate **62**.

Spring **64** is under initial compression, tending to hold lever **58** downward and holding handle **28** upward parallel to the door. A pull on the handle **28** toward the right tends to open the door and tends to move the lever **58** clockwise in Fig. 3.

The same handle **28** may be adapted to actuate both the vacuum release mechanism of Figs. 4 to 6 and the latch mechanism of Figs. 1 to 3.

For this purpose a flat connecting link **67** is provided with an upper elongated aperture **68** that is hooked over the hooked-shaped end **69** of lever **58** and settled in a groove **70**, where it is retained by tension on the links **67**.

To bring the parts into alignment for connection between lever **58** and latch mechanism **71**, the link **67** has an offset at **72**, and it is secured by screw bolts **73** to an actuating plate **74**, through a link extension **78**. Plate **74** is triangular in effect as it has three lobes **75**, **76**, **77**, extending from a central body.

Lobe **77** is secured to the end of the connecting link **67** by means of an extension **78**.

Various types of latching mechanism may be employed, and that selected for illustration is merely by way of example. Such a latching mechanism comprises a supporting bracket **79**, Fig. 3, upon which the triangular plate **74** is pivoted.

There is a U-shaped lever **80**, pivoted at **81** on bracket **79**, and having a pivotal connection at a pin **82** which supports a link **83** carrying a compression spring **84**.

Link **83** is pivotally secured to the latching lever **85**, which carries a transverse nylon roller **86** for engaging the strike **17**.

An upward pull on the link **67** by handle **28** tends to withdraw the latching lever **85** and its roller **86** from the strike **17**, and this is resisted by suitable springs, including spring **64** and another spring which actuates the lever **80**, so that the latching lever **85** is spring-pressed into latching position and can be cammed backward by the beveled surface **19** until the latching lever has its roller **86** engaging the latching shoulder **20**.

The parts are preferably so arranged that the vacuum release mechanism is actuated first, and after that the latch is released, permitting the door to open.

It will thus be observed that I have invented an improved vacuum release mechanism for freezers or household refrigerators, in which the mechanism may be located in a special sealed chamber on the inside of the door shell.

The opening of the door lifts the seal plate, allowing the air to enter, if there is a differential of pressure, thus equalizing the pressures before the door is opened.

A linkable from the door latch mechanism may be connected to the vacuum release mechanism, so that both may be actuated by the same handle with only one lever going through the door, and that one passes through the door at the sealed chamber.

The present mechanism is simple in construction, it includes a minimum number of parts, and it is usable upon various types of refrigerator doors and with various types of latch mechanism.

While I have illustrated and described a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a vacuum release mechanism for refrigerated cabinets of the type having an insulated cabinet with a door opening, an insulated door hingedly mounted on the cabinet for closing said opening, said door being provided with a door seal engaging the front of the cabinet and said door, comprising an outer shell and an inner panel separated by insulation, the improvement which comprises a sealed container mounted on the inside of the outer shell, and having an air-tight engagement with the inside of said shell, said container opening toward the inside of the shell, and said shell being provided with an actuating lever extending through an opening into said sealed container, a handle pivotally mounted on the outside of the shell and operatively secured to said lever, for moving the lever when the handle is pulled in the direction of door opening, said container having an opening in one side adapted to communicate with the interior of the refrigerated cabinet, a valve member in said container and movably mounted to close said opening, said valve member being mounted on an actuating member connected to said lever, and spring means carried by said actuating member and engaging said container for urging said valve to closed position.

2. In a vacuum release mechanism for refrigerated cabinets of the type having an insulated cabinet with a door opening, an insulated door hingedly mounted on the cabinet for closing said opening, said door being provided with a door seal engaging the front of the cabinet and said door, comprising an outer shell and an inner panel separated by insulation, the improvement which comprises a sealed container mounted on the inside of the outer shell, and having an air-tight engagement with the inside of said shell, said container opening toward the inside of the shell, and said shell being provided with an actuating lever extending through an opening into said sealed container, a handle pivotally mounted on the outside of the shell and operatively secured to said lever, for moving the lever when the handle is pulled in the direc-

tion of door opening, said container having an opening in one side adapted to communicate with the interior of the refrigerated cabinet, a valve member in said container and movably mounted to close said opening, said valve member being mounted on an actuating member connected to said lever, and spring means carried by said actuating member and engaging said container for urging said valve to closed position, said valve comprising a metal plate of circular shape and having a resilient gasket covering the valve side of said plate and extending about its edge and inwardly on the other side of said plate to be retained thereby.

3. In a vacuum release mechanism for refrigerated cabinets of the type having an insulated cabinet with a door opening, an insulated door hingedly mounted on the cabinet for closing said opening, said door being provided with a door seal engaging the front of the cabinet and said door, comprising an outer shell and an inner panel separated by insulation, the improvement which comprises a sealed container mounted on the inside of the outer shell, and having an air-tight engagement with the inside of said shell, said container opening toward the inside of the shell, and said shell being provided with an actuating lever extending through an opening into said sealed container, a handle pivotally mounted on the outside of the shell and operatively secured to said lever, for moving the lever when the handle is pulled in the direction of the door opening, said container having an opening in one side adapted to communicate with the interior of the refrigerated cabinet, a valve member in said container and movably mounted to close said opening, said valve member being mounted on an actuating member connected to said lever, and spring means carried by said actuating member and engaging said container for urging said valve to closed position, the said actuating member comprising a connecting rod in the form of a metal plate having an opening at one end adapted to be hooked over the end of said lever, said plate being provided at its opposite end with a metal spring seat engaging said spring.

4. In a vacuum release mechanism for refrigerated cabinets of the type having an insulated cabinet with a door opening, an insulated door hingedly mounted on the cabinet for closing said opening, said door being provided with a door seal engaging the front of the cabinet and said door, comprising an outer shell and an inner panel separated by insulation, the improvement which comprises a sealed container mounted on the inside of the outer shell, and having an air-tight engagement with the inside of said shell, said container opening toward the inside of the shell, and said shell being provided with an actuating lever extending through an opening into said sealed container, a handle pivotally mounted on the outside of the shell and operatively secured to said lever, for moving the lever when the handle is pulled in the direction of door opening, said container having an opening in one side adapted to communicate with the interior of the refrigerated cabinet, a valve member in said container and movably mounted to close said opening, said valve member being mounted on an actuating member connected to said lever, and spring means carried by said actuating member and engaging said container for urging said valve to closed position, the said actuating member comprising a connecting rod in the form of a metal plate having an opening at one end adapted to be hooked over the end of said lever, said plate being provided at its opposite end with a metal spring seat engaging said spring, the said connecting rod being formed with a T shaped end adapted to be received in a groove in said spring seat and having an aperture transversely to said groove, for passing said T shaped end to effect an assembly of the connecting rod and spring seat.

5. In a vacuum release mechanism for a household refrigerator having an insulated door provided with an outer shell, a door handle pivotally mounted on said shell, and having a lever carried thereby, and extending through an aperture in the shell, a sealed housing carried by the inside of said shell adjacent and about said opening and receiving the end of said lever, a valve rod reciprocably mounted in an aperture in one side of said housing, said housing having a valve opening in said side adjacent said rod, a valve member carried by said rod in said housing, and said rod having an actuating engagement with said lever, said rod also carrying a spring seat outside said housing, and said valve being urged to closed position by a compression spring engaging said housing about said rod, and also engaging said spring seat on said rod.

6. In a vacuum release mechanism for a household refrigerator having an insulated door provided with an outer shell, a door handle pivotally mounted on said shell, and having a lever carried thereby, and extending through an aperture in the shell, a sealed housing carried by the inside of said shell adjacent and about said opening and receiving the end of said lever, a valve rod reciprocably mounted in an aperture in one side of said housing, said housing having a valve opening in said side adjacent said rod, a valve member carried by said rod in said housing, and said rod having an actuating engagement with said lever, said rod also carrying a spring seat outside said housing, and said valve being urged to closed position by a compression spring engaging said housing about said rod, and also engaging said spring seat on said rod, said valve rod comprising a metal plate having a valve disc fixedly mounted thereon, and said disc being covered on the side toward said valve aperture with a resilient gasket member about said valve plate and covering one side and extending over the edge of the valve plate on the other side.

7. In a vacuum release mechanism for a household refrigerator having an insulated door provided with an outer shell, a door handle pivotally mounted on said shell, and having a lever carried thereby, and extending through an aperture in the shell, a sealed housing carried by the inside of said shell adjacent and about said opening and receiving the end of said lever, a valve rod reciprocably mounted in an aperture in one side of said housing, said housing having a valve opening in said side adjacent said rod, a valve member carried by said rod in said housing, and said rod having an actuating engagement with said lever, said rod also carrying a spring seat outside said housing, and said valve being urged to closed position by a compression spring engaging said housing about said rod, and also engaging said spring seat on said rod, said valve rod comprising a metal plate having a valve disc fixedly mounted thereon, and said disc being covered on the side toward said valve aperture with a resilient gasket member about said valve plate and covering one side and extending over the edge of the valve plate on the other side, said valve rod being provided at its other end with a T shaped formation, and said valve seat plate having an aperture for passing said T shaped formation, and also having a groove on the side opposite to said spring and extending transversely to said lateral aperture for receiving the T shaped formation.

8. In a combined door latch and vacuum release mechanism, the combination of a cabinet having a door provided with an outer shell, said door having a door seal engaging said cabinet, and said cabinet having a latch strike carried thereby, a door latch carried by the door and movably mounted thereon and provided with a member for engaging said strike, a handle pivotally mounted on said door and having an operative connection with said door latch for moving said latch to unlatching position, a vacuum release mechanism comprising a lever fixedly mounted with respect to said door handle and extending through an aperture in said door shell, a sealed housing on the inside of said door surrounding the end of said lever and said aperture, said sealed housing having a

vacuum release opening, and a spring pressed valve adapted to be opened by said lever when said door is pulled in an opening direction to relieve the vacuum by opening said valve before the door latch permits the door to be opened.

9. In a combined door latch and vacuum release mechanism, the combination of a cabinet having a door provided with an outer shell, said door having a door seal engaging said cabinet, and said cabinet having a latch strike carried thereby, a door latch carried by the door and movably mounted thereon and provided with a member for engaging said strike, a handle pivotally mounted on said door and having an operative connection with said door latch for moving said latch to unlatching position, a vacuum release mechanism comprising a lever fixedly mounted with respect to said door handle and extending through an aperture in said door shell, a sealed housing on the inside of said door surrounding the end of said lever and said aperture, said sealed housing having a vacuum release opening, and a spring pressed valve adapted to be opened by said lever when said door is pulled in an opening direction to relieve the vacuum by opening said valve before the door latch permits the door to be opened, said operative connection including a second lever carried by said door handle, said second lever having pivotal engagement with a connecting link extending to the door latch mechanism.

10. In a combined door latch and vacuum release mechanism, the combination of a cabinet having a door provided with an outer shell, said door having a door seal engaging said cabinet, and said cabinet having a latch strike carried thereby, a door latch carried by the door and movably mounted thereon and provided with a member for engaging said strike, a handle pivotally mounted on said door and having an operative connection with said door latch for moving said latch to unlatching position, a vacuum release mechanism comprising a lever fixedly mounted with respect to said door handle and extending through an aperture in said door shell, a sealed housing on the inside of said door surrounding the end of said lever and said aperture, said sealed housing having a vacuum release opening, and a spring pressed valve adapted to be opened by said lever when said door is pulled in an opening direction to relieve the vacuum by opening said valve before the door latch permits the door to be opened, said operative connection including a second lever carried by said door handle, said second lever having pivotal engagement with a connecting link extending to the door latch mechanism, said second lever being provided with a grooved head on one side, a compression spring seated on said head, and a bracket carried by the door shell and having a grooved head for seating the other end of said spring under compression.

11. In a combined door latch and vacuum release mechanism, the combination of a cabinet having a door provided with an outer shell, said door having a door seal engaging said cabinet, and said cabinet having a latch strike carried thereby, a door latch carried by the door and movably mounted thereon and provided with a member for engaging said strike, a handle pivotally mounted on said door and having an operative connection with said door latch for moving said latch to unlatching position, a vacuum release mechanism comprising a lever fixedly mounted with respect to said door handle and extending through an aperture in said door shell, a sealed housing on the inside of said door surrounding the end of said lever and said aperture, said sealed housing having a vacuum release opening, and a spring pressed valve adapted to be opened by said lever when said door is pulled in an opening direction to relieve the vacuum by opening said valve before the door latch permits the door to be opened, said spring pressed valve including a rod in the form of an apertured plate receiving said lever and fixedly supporting a valve disc, said disc having a resilient shallow covering on the side toward said aperture, said covering extending over the edge of the disc and inwardly on the other side of the disc.

12. In a combined door latch and vacuum release mechanism, the combination of a cabinet having a door provided with an outer shell, said door having a door seal engaging said cabinet, and said cabinet having a latch strike carried thereby, a door latch carried by the door and movably mounted thereon and provided with a member for engaging said strike, a handle pivotally mounted on said door and having an operative connection with said door latch for moving said latch to unlatching position, a vacuum release mechanism comprising a lever fixedly mounted with respect to said door handle and extending through an aperture in said door shell, a sealed housing on the inside of said door surrounding the end of said lever and said aperture, said sealed housing having a vacuum release opening, and a spring pressed valve adapted to be opened by said lever when said door is pulled in an opening direction to relieve the vacuum by opening said valve before the door latch permits the door to be opened, said spring pressed valve including a rod in the form of an apertured plate receiving said lever and fixedly supporting a valve disc, said disc having a resilient shallow covering on the side toward said aperture, said covering extending over the edge of the disc and inwardly on the other side of the disc, said valve rod extending outside said housing, and having a spring seating plate carried by its end, said seating plate engaging a compression spring, the other end of which engages said sealed housing.

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