May 7, 1963 R. SMITH 3,088,294

REFRIGERATING APPARATUS

Filed Jan. 24, 1962

Fig. 1

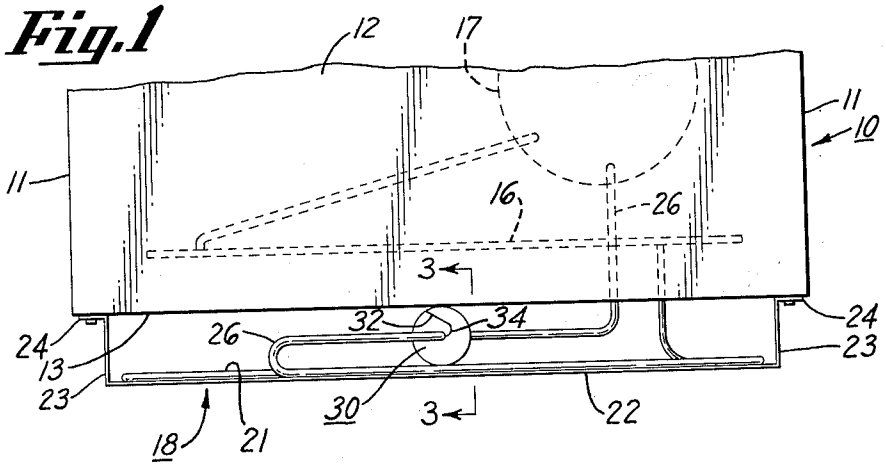


Fig. 2

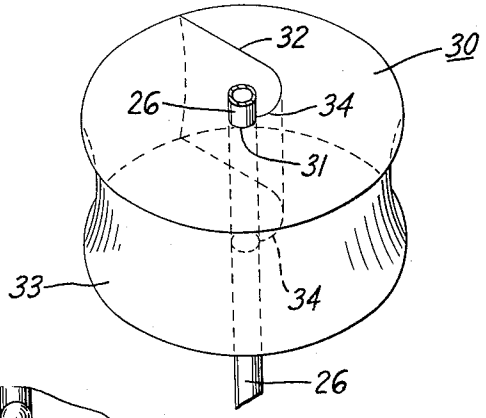
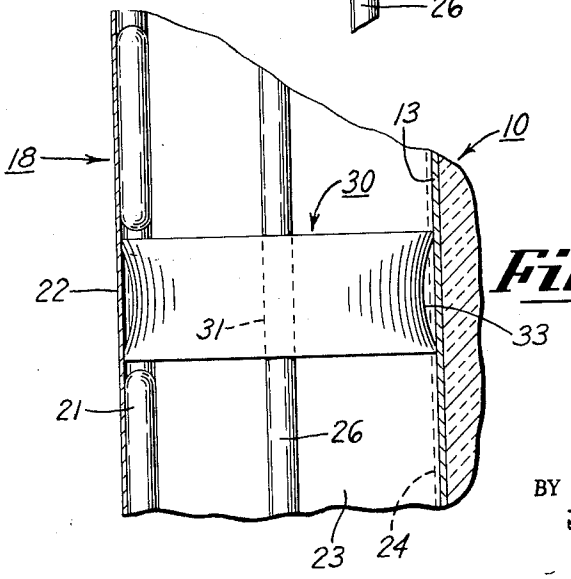


Fig. 3



INVENTOR.
ROBERT SMITH

BY Lloyd M. Keighley.
HIS ATTORNEY

United States Patent Office 3,088,294 Patented May 7, 1963

3,088,294

REFRIGERATING APPARATUS

Robert Smith, Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Filed Jan. 24, 1962, Ser. No. 168,382
4 Claims. (Cl. 62—296)

This invention relates to refrigerating apparatus and particularly to a refrigerator cabinet having a refrigerating system associated therewith including relatively long runs of pipe or conduit extensions connecting spaced apart elements thereof in refrigerant flow relationship with one another.

In an upright refrigerator cabinet provided with a machine compartment in the lowermost part thereof that houses a portion of a refrigerant translating device of a refrigerating system, such as a resiliently mounted casing containing a motor-compressor unit of the system, and wherein the device includes a vertically elongated refrigerant condenser structure which is secured to and extends along the back wall of the cabinet, there is a refrigerant conveying pipe or conduit leading from the casing upwardly to the upper part of the condenser. This pipe or conduit is preferably extended through a space provided between the cabinet back wall and the condenser for protective purposes. Since the motor-compressor containing casing is resiliently mounted in the machine compartment of the refrigerator cabinet, this casing has limited movement relative to the cabinet, both during transportation thereof and during operations of the motor to drive the compressor after installation. Due to the length of extension of the refrigerant pipe or conduit from the casing up to the uppermost part of the condenser, this conduit is subjected to a great amount of shifting movement while the refrigerator cabinet is being transported and vibrations after the cabinet is installed caused by movement of the casing on its resilient mounting in the machine compartment. Vibrations of this relatively long run of refrigerant conduit creates objectionable noises in the refrigerator cabinet during operations of the refrigerating system associated therewith. In order to stop shifting and to dampen vibrations of this conduit, it has been proposed to support a portion thereof intermediate its connected ends by a regular or conventional rubber-like grommet onto the conduit just prior to assembling the closed refrigerating system into association with a refrigerator cabinet, which grommet is of a size to occupy the space between the cabinet back wall and a portion of the condenser structure so as to bear thereagainst. I have found that a regular or conventional grommet provided with a straight linear slit from an aperture therein laterally to a peripheral wall thereof, which permits assembly of the grommet onto the conduit by passing the conduit through the slit, has not been entirely satisfactory for the purpose specified. Unless great care is exercised in orienting the straight linear slit of a conventional grommet, as the grommet is placed onto the conduit, substantially 90° to 180° away from the direction of anticipated jolts or jars imparted to the conduit during shipment of the refrigerator cabinet and severe vibrations of the conduit occurring during operations of the motor within the limited movable casing, the conduit will work its way into and through such slit to eventually become detached from the grommet. I therefore contemplate the use of a vibration dampening means for the purpose herein set forth employing a novel grommet that will overcome fallacies inherent in the construction of common or conventional grommets.

An object of my invention is to provide a refrigerating

apparatus with an improved shock absorbing member or vibration dampening means for placement on a part of a refrigerating system of the apparatus and for engagement with certain walls of the apparatus.

Another object of my invention is to provide in combination with a refrigerator cabinet an improved support and vibration dampening means for a freely extending conduit of a refrigerating system associated with the cabinet.

A further object of my invention is to provide an improved vibration dampener employing a novel grommet therein which will resist entrance of a conduit or the like element projected through and retained within an aperture thereof into a slit in the grommet irrespective of the position of the slit relative to the conduit and walls engageable by the grommet.

A still further and more specific object of my invention is to provide a resilient disc-like grommet with a slit therein having curved or tortuous walls, which walls are instrumental in preventing a conduit extending through and aperture of the grommet from entering the slit.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of the present invention is clearly shown.

In the drawing:

FIGURE 1 is a fragmentary top view of a refrigerating apparatus including a refrigerator cabinet and a refrigerating system associated with the cabinet having my invention embodied therein;

FIGURE 2 is a perspective view of my improved vibration dampener showing a small diametered refrigerant conveying conduit element retained in an aperture of the grommet member thereof; and

FIGURE 3 is an enlarged fragmentary sectional view taken on the line 3—3 of FIGURE 1 showing the grommet engaging opposed walls of the apparatus.

Referring to the drawing, there is shown in FIGURE 1 thereof a fragmentary top view of a refrigerating apparatus for illustrating my invention. The refrigerating apparatus comprises any suitable or desirable refrigerator cabinet **10** having a food storage chamber therein, a machine compartment below the chamber and a refrigerating system associated with cabinet **10** as is conventional and well known in the refrigeration art. Cabinet **10** includes insulated upright side walls **11**, an insulated top wall **12**, an insulated back wall **13** and an insulated bottom wall (not shown) bounding the food chamber therein. The outer cabinet metal shell or walls extend below the insulated food chamber to provide walls of the machine compartment in the lower part of cabinet **10**. A refrigerating system associated with cabinet **10** comprises a refrigerant evaporator indicated at **16**, mounted in the food chamber of cabinet **10** for cooling same, a refrigerant translating device including an electric motor drivingly connected to a refrigerant compressor each enclosed or sealed in a casing **17** and a refrigerant condenser structure **18**. A plurality of pipes or conduits connect evaporator **16**, casing **17** and condenser **18** in closed refrigerant circulating relationship. Casing **17** containing the motor-compressor unit of the refrigerant translating device is mounted on a suitable support in the lower machine compartment of refrigerator cabinet **10** for limited movement relative to the cabinet, preferably by resilient mounting means constructed as disclosed and more fully described in the patent to E. H. Horlacher 2,930,556, dated March 29, 1960. Condenser **18** is a vertically elongated structure and includes a coiled conduit **21** secured to a metal plate **22** by brazing or soldering same thereto. Plate **22** of the condenser structure has its sides bent in-

wardly as at 23 with flanged edges 24 thereon secured to the back wall 13 of cabinet 10, by screws, or the like, to provide a space or air flue intermediate condenser 18 and wall 13 of the cabinet. The elongated condenser structure extends from a point in back of the machine compartment in cabinet 10 upwardly along the cabinet rear wall to a point substantially above the machine compartment. This arrangement of a condenser is not new and is well known to those skilled in the art. One of the connecting refrigerant conveying conduits of the refrigerating system, such as conduit 26, leads from the resiliently mounted casing 17 to the upper end of conduit 21 of the vertically elongated condenser structure 18. As hereinbefore mentioned, this relatively long run or conduit extension 26 is subjected to sudden jolts while the refrigerating apparatus is being transported which may damage or break its connection to casing 17 and/or condenser 18 and also is vibrated during operations of the motor-compressor unit in casing 17 which vibration at times creates objectionable noises. A conventional resilient rubber-like grommet provided with a straight line or linear slit extending laterally from the axis of an aperture therein to a peripheral wall thereof has been assembled onto a mid point of the conduit extension 26 prior to inserting the unitary closed refrigerating system into a cabinet for causing engagement of the grommet with the cabinet back wall 13 and a portion of the condenser structure 18 to dampen vibrations of conduit 26. Such a conventional grommet has not proven satisfactory as an everlasting vibration dampener in the location and arrangement as herein disclosed. One of the main reasons for a conventional grommet of the type just described being unsatisfactory in a construction or arrangement of the character disclosed is that of all portions of the straight linear slit in the grommet being aligned perpendicularly with the axis of conduit 26, thus rendering this conduit, upon jolting or bumping same and during severe vibrations thereof in a direction along or paralleling the length of the straight slit, capable of biting into and eventually spreading walls of such slit apart to permit the conduit to pass outwardly therethrough whereby the grommet becomes detached from conduit 26. This fallacy or unfitness of such a conventional grommet for use in the location specified by the arrangement of the present disclosure is desired to be overcome or eliminated.

Conducted experiments indicate that a resilient disc-like grommet having an aperture therein for the reception of a conduit or the like element and provided with a slit which is substantially tortuous in shape at least from a point immediately adjacent the aperture and to a point spaced laterally therefrom or to a peripheral wall or edge of the grommet forms a much better and far more practical vibration snubbing or dampener member. In accordance with my discovery I place a novel and improved grommet, indicated by the reference numeral 30 in the various figures of the drawing, upon a mid point of the freely extending conduit 26 to engage the back wall 13 of cabinet 10 and a wall portion of condenser 18. The grommet 30 is a disc-like resilient member formed of rubber or the like material having an aperture 31 substantially in its center and provided with a slit 32 extending continuously from this aperture laterally to the peripheral wall 33 thereof. The wall 33 of grommet 30 is a concaved surface for a purpose to be hereinafter described. The slit 32 in grommet 30 or at least that portion thereof indicated at 34 adjacent aperture 31 is curved or is directed in changing directions and/or is tortuous in its extension laterally away from the axis of the aperture or of conduit 26 located therein (see FIGURE 2). It is to be understood that by defining a slit which splits the one side of grommet 30 as herein employed, I also include thereby a slot wherein walls thereof may be spaced apart a somewhat greater distance than is ordinarily existent with a slit. In assembling grommet member 30 onto a mid portion of conduit 26, before the closed

refrigerating system is inserted into cabinet 10 and secured thereto, walls of slit 32 are spread apart and the conduit is passed therethrough from the periphery 33 thereof into the aperture 31. Walls of slit 32 are released and the wall of aperture 31 grips conduit 26 to hold grommet 30 in place against slippage along the conduit. As the closed unitary refrigerating system is moved into association with cabinet 10 from the rear thereof, in order to secure or clamp condenser structure 18 onto the back wall 13 of the cabinet, top and bottom portions of the concaved peripheral wall 33 of grommet 30 engage and are slightly deformed in becoming wedged between the cabinet wall 13 and the inner wall surface of plate 22 of the condenser structure 18 (see FIGURE 3). By virtue of that portion 34 of slit 32 adjacent aperture 31 being of zigzag or tortuous formation and/or curved in various directions laterally therefrom, it makes no difference as to the final location of grommet member 30 on conduit 26. The walls of portion 34 of slit 32 immediately adjacent conduit 26 are directed angularly with respect to a line extended perpendicular to the axis of the conduit and they afford maximum resistance to conduit 26 reentering the slit once the conduit is disposed in aperture 31, thus preventing displacement of conduit 26 relative to grommet 30 irrespective of the direction of sudden bumps, jars and jolts imparted to the conduit or the direction of severe vibrations thereof. Such jolts or vibrations imparted to conduit 26 will seldom occur consecutively in one or a single direction aligned with the point of entry of slit 32 with aperture 31 of grommet 30 and therefore this grommet is rendered more effective over conventional grommets in providing opposition or obstructions to the entrance of a small diametered conduit or the like element into the slit of a grommet.

From the foregoing it should be apparent that I have provided a vibration dampener with an improved grommet structure surrounding and supporting a conduit or the like element projected through a hole or aperture in the grommet and which structure prevents accidental displacement of the conduit therefrom. The configuration of a slit in a grommet of a vibration dampening means as herein described provides a grommet that is practical and of long life in arrangements of parts of a refrigerating apparatus of the tlue disclosed. Assembly of the grommet onto the conduit of a refrigerating apparatus along a production line in a factory requires no particular expert skill and once placed on the conduit, inspection as to the location of the slit in the grommet relative to walls engaged by the grommet or to the location of the conduit surrounded thereby is not needed. By my improvement, I facilitate assembling a closed refrigerating system into a refrigerator cabinet which can be carried out quickly without manual orientation of a slit in a grommet on a conduit thereof in a certain fashion or in a predetermined direction relative to other elements of the refrigerating apparatus with which the grommet is to be associated.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A refrigerating apparatus comprising in combination:

(*a*) a cabinet having a food storage chamber and a machine compartment therein beyond said chamber,

(*b*) a refrigerating system to be associated with said cabinet including a refrigerant evaporator for cooling said chamber, a refrigerant condenser and a motor-compressor unit located in a casing,

(*c*) said casing being upon associating the refrigerating system with said cabinet mounted within said machine compartment thereof and having limited movement relative to the cabinet,

(*d*) said condenser being an elongated structure for location outside said machine compartment and

adapted to be secured to an upright outer wall of said cabinet in spaced relation thereto,

(*e*) conduits connecting said evaporator, said condenser and said casing in closed refrigerant flow relationship,

(*f*) one of said conduits leading from said casing upwardly of the machine compartment after associating the refrigerating system with said cabinet between the outer wall thereof and the elongated condenser structure and connected to an upper portion of said condenser,

(*g*) a resilient grommet provided with a slit through its thickness extending continuously from an aperture therein to a peripheral edge thereof through which said one conduit is passed in assembling said grommet thereon prior to securing said condenser structure to said cabinet upright outer wall,

(*h*) said grommet embracing the one conduit and being clampingly compressed intermediate the condenser structure and said cabinet outer wall by the securement of said structure thereto whereby the wall of said aperture in the grommet is caused to grip said one conduit and dampen vibrations thereof while the limited relative movement of said casing occurs, and

(*i*) walls of the slit in said grommet having portions directed in changing directions laterally away from the axis of said aperture therein for preventing entry of said one conduit into said slit upon jolting said cabinet during moving and transportation thereof.

2. A refrigerating apparatus comprising in combination:

(*a*) a cabinet having a food storage chamber and a machine compartment therein beyond said chamber,

(*b*) a refrigerating system to be associated with said cabinet including a refrigerant evaporator for cooling said chamber, a refrigerant condenser and a motor-compressor unit located in a casing,

(*c*) said casing being upon associating the refrigerating system with said cabinet mounted within said machine compartment thereof and having limited movement relative to the cabinet,

(*d*) said condenser being an elongated structure for location outside said machine compartment and adapted to be secured to an upright outer wall of said cabinet in spaced relation thereto,

(*e*) conduits connecting said evaporator, said condenser and said casing in closed refrigerant flow relationship,

(*f*) one of said conduits leading from said casing upwardly of the machine compartment after associating the refrigerating system with said cabinet between the outer wall thereof and the elongated condenser structure and connected to an upper portion of said condenser,

(*g*) a resilient disc-like grommet provided with a slit through its thickness extending continuously from an aperture therein to a peripheral edge thereof through which said one conduit is passed in assembling said grommet thereon prior to securing said condenser structure to said cabinet upright outer wall,

(*h*) the peripheral edge of said grommet intermediate faces thereof being undercut and of concavity shape to increase its compressibility,

(*i*) said disc-like grommet embracing the one conduit and being clampingly compressed between the condenser structure and said cabinet outer wall by the securement of said structure thereto whereby the wall of said aperture in the grommet is caused to grip said one conduit and dampen vibrations thereof while the limited relative movement of said casing occurs,

(*j*) at least that portion of walls of the slit in said grommet adjacent the aperture therein being curved laterally away from the axis of said aperture in the grommet, and

(*k*) said curved portion of walls of the slit in said grommet preventing entry of said one conduit into said slit upon jolting said cabinet during moving and transportation thereof.

3. A grommet comprising:

(*a*) a one-piece resilient member having an aperture therein,

(*b*) a vertical slit through the thickness of said member extending continuously from the aperture to a peripheral edge of the member,

(*c*) the opposed walls of said slit being contiguous with each other and movable away from one another for insertion through the slit into said aperture of an element to be embraced by said grommet, and

(*d*) at least that portion of said vertical slit in the grommet member adjacent its juncture with the aperture therein being curved laterally away from the axis of said aperture.

4. A grommet comprising:

(*a*) a one-piece resilient rubber-like member having a circular aperture therein,

(*b*) a vertical slit through the thickness of said member extending continuously from the aperture to a peripheral edge of the member,

(*c*) the opposed walls of said slit being contiguous with each other and movable away from one another for insertion through the slit into said circular aperture of a round element to be embraced by said grommet, and

(*d*) said contiguous walls having portions intermediate their ends directed in different directions from the juncture of the slit with said aperture laterally away from the axis of the aperture in said grommet member.

References Cited in the file of this patent

UNITED STATES PATENTS

1,697,814	Forbes	Jan. 1, 1929
2,024,295	Kucher	Dec. 17, 1935
2,355,126	Webster	Aug. 8, 1944
2,961,691	Roy	Nov. 29, 1960

FOREIGN PATENTS

857,396	Great Britain	Dec. 29, 1960