March 29, 1960 E. L. HORLACHER 2,930,556

REFRIGERATING APPARATUS

Filed Oct. 17, 1957

2 Sheets-Sheet 1

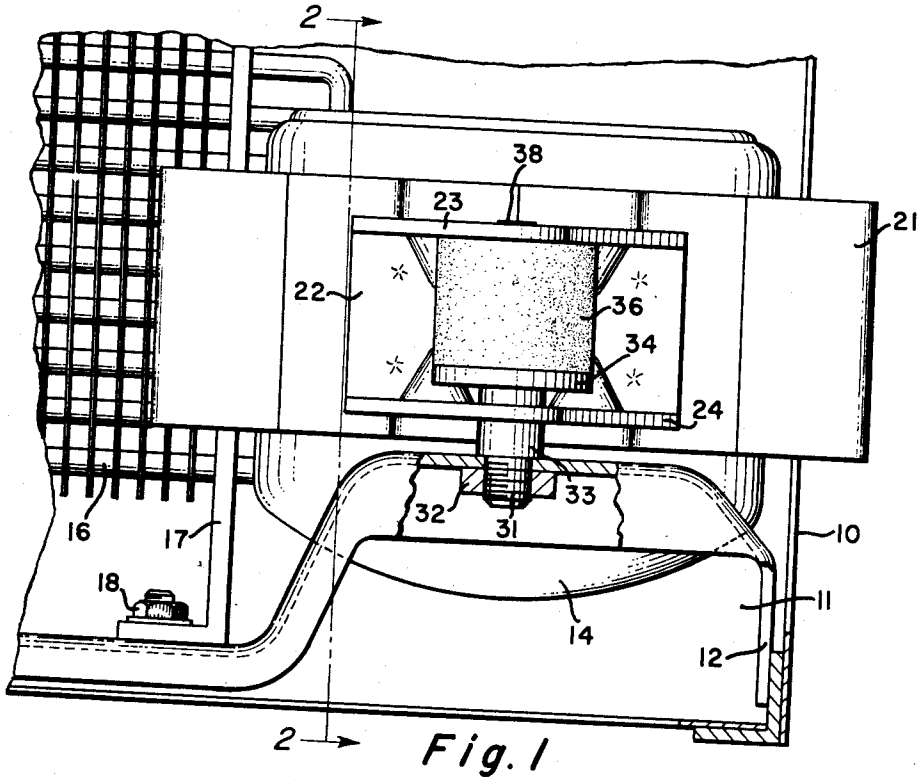


Fig. 1

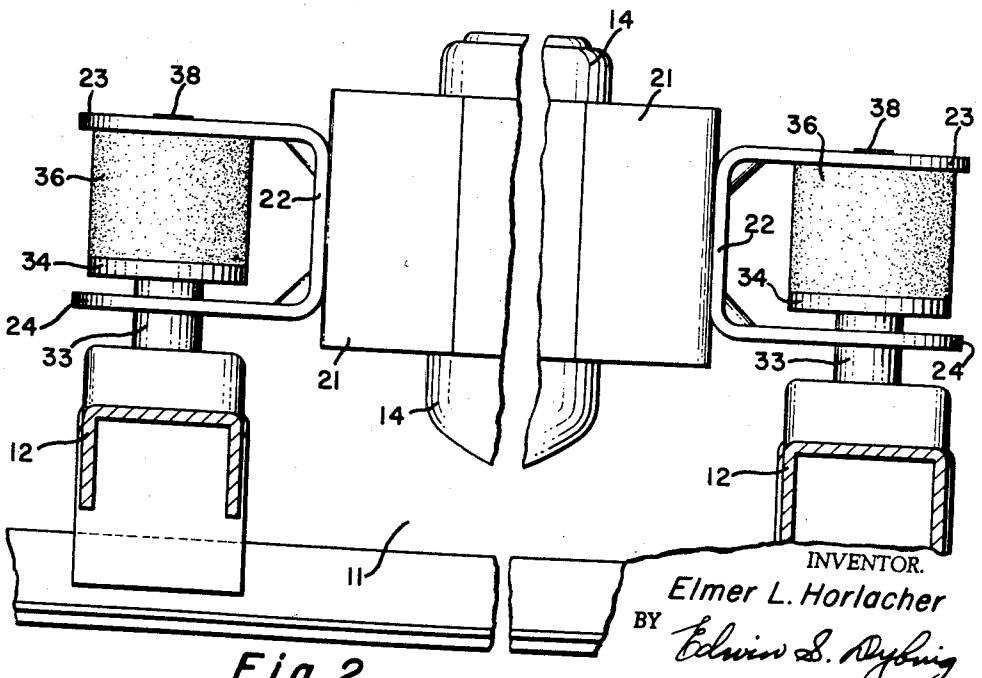


Fig. 2

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2 Sheets-Sheet 2

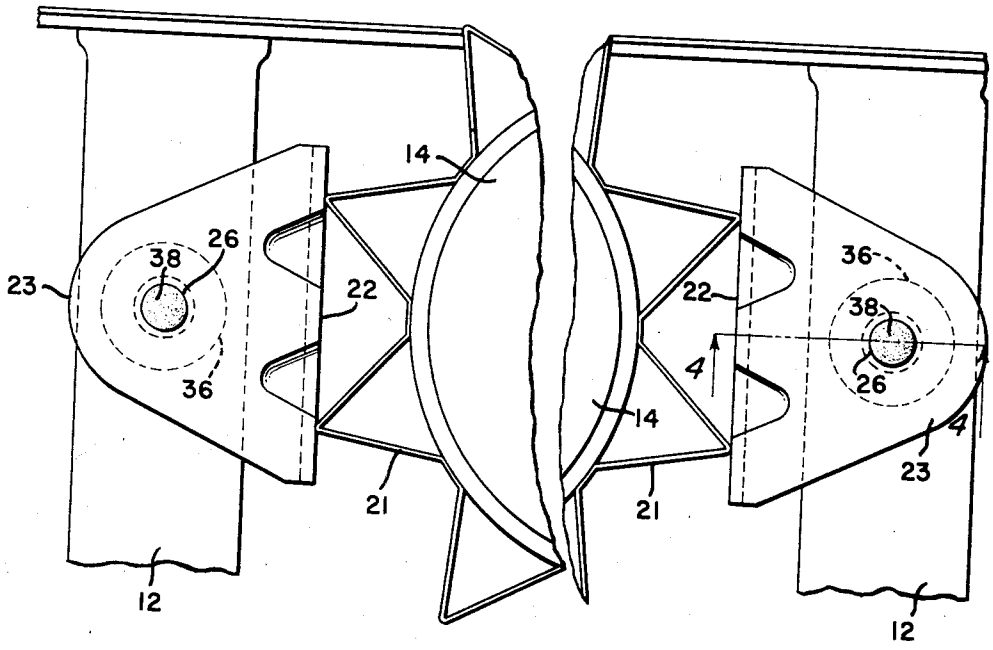


Fig. 3

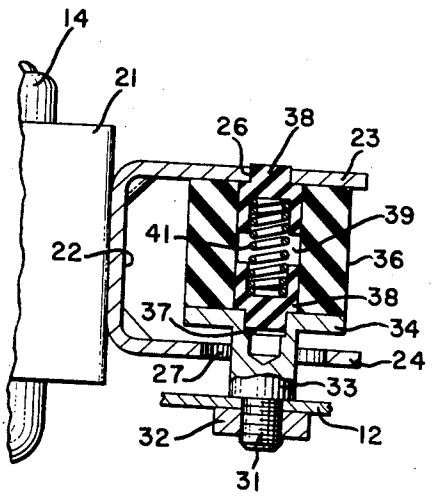


Fig. 4

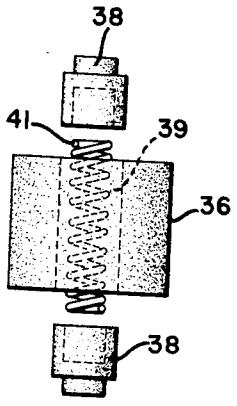


Fig. 5

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REFRIGERATING APPARATUS

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Application October 17, 1957, Serial No. 690,644

3 Claims. (Cl. 248—15)

This invention relates to refrigerating apparatus and particularly to an arrangement for supporting a casing containing an operable unit of such apparatus upon a support carried by a part of a refrigerator cabinet.

An object of my invention is to provide a simplified and low-cost resilient mounting for a motor-compressor unit of a refrigerating system upon a support therefor in a refrigerator cabinet which performs three distinct essential functions in that it will cushion ordinary vibrations of the unit, permit a limited rotary movement of the unit relative to its support and arrest abnormal movements of the unit.

Another object of my invention is to provide in a mounting arrangement for a sealed casing containing an electric motor and a compressor driven thereby, which permits a limited rotary movement of the casing with respect to its support, a means that will check or arrest any abnormal rotation of the casing and convert the force thereof into a swinging movement of the casing in pendulum fashion.

A further object of my invention is to provide a casing supporting means which eliminates the necessity of special or additional hold-down bolts or clamps for the casing during shipment of a refrigerator cabinet in which the casing is mounted and affords a rotary movement of the casing when the refrigerator is installed particularly during starting and/or stopping of a motor-compressor contained in the casing.

A still further object of my invention is to utilize the resiliency of a rubber-like spool located between legs of two substantially equally spaced apart U-shaped brackets secured to a casing containing an operable element for absorbing vibrations thereof, to isolate sounds generated thereby against transmission through the casing support to a refrigerator cabinet and to employ a part of the support together with a portion of one leg of the U-shaped brackets for positively checking or arresting abnormal rotary motion of the casing relative to the support.

In carrying out the foregoing objects it is a more specific object of my invention to hold a rubber-like spool in a resilient motor-compressor casing mounting against shifting out of place between a part of the casing support and a leg of a U-shaped mounting bracket by rubber-like trunnions fitted therein or interlocked therewith at a time when the mounting is arresting abnormal rotary movement of the casing relative to its support.

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

In the drawings:

Figure 1 is a fragmentary side elevational view of a preferred embodiment of the invention showing a casing containing a motor-compressor mounted on a support in a machine compartment of a refrigerator cabinet;

Figure 2 is a broken side elevational view taken on the line 2—2 of Figure 1 showing opposed mounting means of the casing;

Figure 3 is a broken or fragmentary top view of the motor-compressor casing disclosed in Figures 1 and 2 showing opposed mounting means at two substantially equally spaced apart points around the supported casing;

Figure 4 is an enlarged vertical sectional view of one of the two similar casing mounting means and is taken on the line 4—4 of Figure 3; and

Figure 5 is an exploded view of elements of the resilient means employed in the casing mount.

Referring to the drawings I show in Figure 1 thereof a wall or walls **10** of a refrigerator cabinet of conventional construction provided in its lower portion with a machine compartment **11**. A rigid metal frame **12** within compartment **11** is stationarily secured, by bolts or the like, to a part of cabinet **10** and forms or provides a support member for mounting a sealed metal casing member **14** containing an operable element or eelments in the form of an electric motor and a compressor driven thereby of a portion of a refrigerant translating unit of a closed refrigerating system associated with the refrigerator **10**. The refrigerant translating unit of the refrigerating system also includes a refrigerant condenser or condensing coil **16** carried by suitable uprights **17** mounted on the frame-like support member **12** by bolts or the like **18**. The closed refrigerating system also includes a refrigerant evaporator (not shown) located in a food storage chamber (not shown) provided within cabinet **10** and utilized to cool the interior thereof. The evaporator is connected by suitable pipes or conduits with the refrigerant translating unit, such, for example, with the casing **14** and condenser **16**. The construction of a motor-compressor containing sealed casing and the operation of a refrigerating system associated with a refrigerator cabinet as described is now conventional and well known.

The sealed casing **14**, containing the operable elements or motor and compressor, has metal heat radiating fins **21** welded or otherwise rigidly secured in intimate thermal contact therewith. These fins **21**, in addition to aiding in dissipating heat generated in casing **14** therefrom, serve as means for securing mounting brackets **22** to casing member **14** for supporting same upon the frame support or support member **12**. As best indicated in Figures 2, 3 and 4 of the drawings, a pair of U-shaped metal brackets **22** are spot welded to the metallic fins **21** on opposite sides of casing **14** so as to be spaced apart an equal distance around the casing. The horizontal legs of the U-shaped brackets **22** are disposed one above another to provide an upper horizontal leg **23** and a lower horizontal leg **24** thereon with the base of the U of the brackets firmly secured to fins **21** on casing member **14**. Upper leg **23** of the brackets **22** is provided with a central round hole **26** and the lower leg thereof has a larger round hole **27** provided therein (see Figure 4). Each of the mounting means for casing member **14** comprises an upstanding metal stud **31** welded or rigidly secured to frame or support **12** by a nut **32**. Each stud **31** is provided with a shank portion **33** and an enlarged circular flat-topped platform portion **34**. The shank portion **33** of a stud **31** projects through the opening **27** in the lower leg **24** of brackets **22** so as to locate the platform portion **34** thereof intermediate legs **23** and **24** of the U-shaped brackets. Rubber-like bushing or spool **36** is disposed between platform portion **34** of a stud **31** and the upper leg **23** of the brackets **22**. Means is provided to hold spool or bushing **36** in place between a stud **31** and a leg **23** of the U-shaped brackets. The platform **34** of a stud **31** is provided with a recess or cavity **37** in its upper surface and similar rubber-like buttons or trunnions **38** within the bore **39** of spools **36** project therefrom into recess **37** in stud **31** and into aperture or opening **26** in the upper leg **23** of the U-shaped brackets **22**. A coil spring

41 in bore 39 compressed between the opposed buttons or trunnions 38 biases them in a direction outwardly of the bore in spools 36 into the aperture 26 and recess 37. A spool 36, buttons or trunnions 38 and a spring 41 is clearly illustrated in Figure 5 of the drawings and any suitable method of inserting this subassembly between leg 23 of a bracket 22 and the platform portion 34 of a stud 31 may be employed. It is to be noted that the weight of casing 14 and the operable element or elements therein normally maintain bushings or spools 36 and springs 41 under compression between the upper legs 23 of U-shaped brackets 22 and the top surface of platform portion 34 of studs 31 with the stud platforms 34 spaced a substantial distance above the lower leg 24 of the brackets. The springs 41 thus augment the spools or trunnions 36 in resiliently supporting casing 14 upon the frame support member 12. It is also to be noted that while metallic brackets and a metallic stud are employed to secure the casing 14 upon support 12 there is however no direct metal-to-metal contact therebetween since the platform 34 and the shank portion 33 of studs 31 are normally spaced from the lower leg 24 of brackets 22. The arrangement therefore permits the spools or bushings 36 to provide a sound deadening mounting which prevents transmission of noise created in casing 14, by operation of the motor and compressor therein, to the frame or support for the casing and to cabinet 10.

I have, under actual tests, found that the presently disclosed arrangement in addition to being of low manufacturing costs also serves several purposes in the mounting of a sealed casing, having a motor and a compressor disposed one above the other therein, upon a support. The spools 36 together with springs 41 cushion up and down movement of the sealed casing 14 without any metal parts of the mounting striking or contacting one another. Due to the length of spools 36 being disposed substantially at right angles to a portion of an arc about the circumference of cylindrical casing 14 the compressive resiliency of these spools is sufficient to resist and yieldably snub any normal rotary movement of the casing relative to support 12. The arrangement is such that the mounting or carrying means for casing 14 withstands jars or jolts thereof relative to its support 12 during shipment of a refrigerator cabinet with the casing therein. Any abnormal rotary force imparted to casing 14 by the operable elements therein, by shifting of the refrigerator cabinet upon a floor and/or by shifting of the refrigerator cabinet during shipment thereof rotates the casing and causes the wall of opening 27 in lower legs 24 of the U-shaped brackets 22 to engage or abut against the shank portion 33 of studs 31. In this manner the abnormal rotary force imparted by casing 14 to its resilient mountings is arrested and the need for tightly or rigidly clamping the mountings to the support 12 by shipping bolts is eliminated. After a refrigerator cabinet having a motor-compressor sealed within a casing supported therein has been installed in a home the most objectionable movement of the casing relative to its support has been found to be due to starting and/or stopping of the motor and compressor. That is at the moment the motor and compressor starts operating or their operation is stopped the motor rotor, motor shaft and compressor eccentric causes an unbalanced condition within the casing 14 and this tends to rotate the casing. The rotation of casing 14 causes the resilient bushings or spools 36 to tilt, in parallelism, at an angle relative to the vertical thus they are further compressed, between platform portion 34 of studs 31 and legs 23 of brackets 22, and snub rotary movement of the casing relative to its support and they yieldingly limit such casing rotation to a normal predetermined distance. When the rotary force imparted by the casing to its support diminishes the resiliency of the spools 36 permit them to resume their normal vertical position and thus return casing 14 to its normal resiliently supported location. The resiliency of the buttons or trunnions 38 and springs 41 while under compression when supporting casing 14 increase the supporting capacity of the spools 36 and also aid in returning the spools to their normal vertical position after they have been tilted by rotary movement of the casing. By positively stopping or arresting any abnormal rotary movement of casing 14, by wall of opening 27 in lower leg 24 of the U-shaped brackets 22 engaging the shank portion 33 of studs 31, in the manner previously described any abnormal rotary force applied to the support 12 is converted into a force which, by virtue of the resiliency of spools 36, tends to create a pendulum-like movement of casing 14 upon its carrying support. Obviously too much rotary movement of casing 14 relative to its support might fracture a refrigerant conduit or pipe leading to the casing or loosen the connection thereof with the casing. Thus by arresting and converting any abnormal force imparted to the motor-compressor containing casing 14 into a pendulum-like swinging movement of the casing at two substantially equally spaced apart points therearound too great a twisting of the conduits and/or their connections to the casing is eliminated and the danger of fracturing the conduits is diminished.

It should, from the foregoing, be apparent that I have provided an improved resilient carrying arrangement with a minimum number of substantially inexpensive parts having a two-point mounting of a motor-compressor casing on a support in a refrigerator cabinet wherein the casing is at all times free to move in restricted fashion in several different directions and its movement is effectively cushioned or normally snubbed. My improved arrangement absorbs high frequency vibrations and deadens or prevents any noises created in the supported casing from being amplified by its support on the refrigerator cabinet and transmitted to a room in which the cabinet is located. Also by converting abnormal rotary movement imparted to the supported casing into a pendulum swinging movement thereof jars or shocks applied to the casing are arrested and absorbed thus eliminating the use of hold-down shipping clamps or bolts and the like which are ordinarily discarded and wasted after installation of a refrigerator cabinet. By providing means for holding the rubber-like supporting spools against being shifted out of place between the platform portion of the mounting studs and the one leg of the U-shaped mounting brackets during arresting of abnormal movement of the resiliently supported casing the present mounting is rendered certain in function and will withstand rigid tumble tests.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted as may come within the scope of the claims which follow.

What is claimed is as follows:

1. A mounting for a casing containing an operable element adapted to be started and stopped including a pair of resilient devices attaching the casing at two equal spaced apart points therearound to a support exteriorly thereof, each of said devices comprising a U-shaped bracket having the base of the U thereof secured to an outer exposed part of said casing with the legs of said bracket extending laterally therefrom one above another, the upper leg of said U-shaped bracket having an opening therein and the lower leg thereof having an opening therein aligned with the opening in said upper leg, a stud secured to said support and projecting through the opening in said lower leg of said bracket in spaced relation to the wall of the opening therein, a platform integrally formed on the top of said stud and provided with a recess therein, said platform being spaced above the lower leg of said U-shaped bracket to position same intermediate said legs of the bracket, a rubber-like spool having a bore therethrough interposed between the platform on said stud and the upper leg of said bracket for supporting said casing on said support, the starting and/or stopping of said element imparting a rotary movement

to said casing relative to said support, said lower leg of said bracket being freely movable with respect to said stud whereby said spool yieldingly snubs the rotary movement of said casing and limits same to a predetermined distance, said wall of the opening in said bracket lower leg being engageable with said stud below the bottom of said spool to arrest rotation of said casing beyond said predetermined distance upon abnormal rotation thereof and for rendering the entire length of said spool effective to convert the abnormal rotary force of said casing into a swinging movement thereof in pendulum fashion, and trunnions disposed within the bore of said spool projecting into the opening in said upper bracket leg and said recess in said stud platform respectively preventing shifting of the spool out of place therebetween while said devices convert the abnormal rotation of said casing into the pendulum swinging movement thereof.

2. A mounting as defined by claim 1 wherein a coil spring is compressed between the trunnions within the bore of the spool of each resilient device for augmenting action of the spool in snubbing rotary movement of the casing.

3. A mounting for a casing containing an operable element adapted to be started and stopped including a pair of resilient devices attaching the casing at two equal spaced apart points therearound to a support exteriorly thereof, each of said devices comprising a U-shaped bracket having the base of the U thereof secured to an outer exposed part of said casing with the legs of said bracket extending laterally therefrom one above another, the upper leg of said U-shaped bracket having an opening therein and the lower leg thereof having an opening therein aligned with the opening in said upper leg, a stud secured to said support and projecting through the opening in said lower leg of said bracket in spaced relation to the wall of the opening therein, a platform integrally formed on the top of said stud and provided with a recess therein, said platform being spaced above the lower leg of said U-shaped bracket to position same intermediate said legs of the bracket, a rubber-like spool interposed between the platform on said stud and the upper leg of said bracket for supporting said casing on

said support, the starting and/or stopping of said element imparting a rotary movement to said casing relative to said support, said lower leg of said bracket being freely movable with respect to said stud whereby said spool yieldingly snubs the rotary movement of said casing and limits same to a predetermined distance, said wall of the opening in said bracket lower leg being engageable with said stud below the bottom of said spool to arrest rotation of said casing beyond said predetermined distance upon abnormal rotation thereof and for rendering the entire length of said spool effective to convert the abnormal rotary force of said casing into a swinging movement thereof in pendulum fashion, a first rubber-like trunnion at the top of said spool projecting into the opening in said upper bracket leg, a second rubber-like trunnion at the bottom of said spool projecting into the recess in said stud platform, and said rubber-like trunnions forming the sole tying connection of said spool to said bracket upper leg and said stud platform whereby said trunnions prevent shifting of the spool out of place therebetween while said devices convert the abnormal rotation of said casing into said pendulum swinging movement thereof.

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