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(54) **Refrigerator compressor system and motor protector unit therefor.**

(57) A rotary type of refrigerator compressor and a motor for operating the compressor are arranged within an hermetically sealed container and a motor protector is mounted on a cluster block connector within the container on lead-through pins which extend through the container wall for conveniently connecting the motor protector into the motor circuit to be thermally responsive to rise in temperature within the container for preventing overheating of the motor on the occurrence of fault conditions in the refrigerator compressor system.

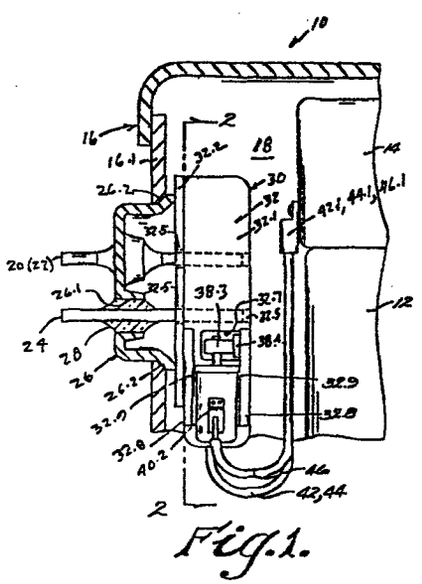

Fig.1.

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REFRIGERATOR COMPRESSOR SYSTEM AND MOTOR PROTECTOR UNIT THEREFOR

Background of the Invention

The field of this invention is that of electrical motors and the invention relates more particularly to the use of current and temperature responsive motor protectors for protecting electrical motors against overheating in certain types of refrigerator compressor systems.

Hermetically sealed refrigerator compressor systems typically mount a refrigerator compressor and an electrical motor for operating the compressor within a fluid-filled, hermetically-sealed container. Lead-through pins extend through a wall of the container in sealed, electrically insulated relation to the wall and to each other to electrically connect the motor in an electrical circuit for operating the compressor. A motor protector is mounted on the motor inside the container by use of a bracket or the like to be thermally responsive to rise in temperature of the motor such as might result from the occurrence of a fault condition in the motor. Typically, the protector is also connected in the motor circuit in such a way that it is responsive to overcurrent conditions in the motor such as might result from such fault conditions to also interrupt operation of the motor for preventing overheating of the motor. The mounting of the motor protector on the motor within the container is typically performed by the manufacturer of the refrigerator compressor system using motor protector means furnished by another manufacture and

typically involves considerable inconvenience and expense. It can also result in arranging the motor protector in a non uniform manner on the motor such that the motor may provide improper protection or may cause nuisance tripping in the system.

Brief Summary of the Invention

It is an object of this invention to provide a novel and improved hermetically sealed refrigerator compressor system; to provide such a system utilizing a rotary type of compressor within the hermetically-sealed container of the system; to provide such a system which is characterized by the ease and convenience of its assembly and of the reliability of its thermal and current response properties; and to provide a novel and improved motor protector unit for use in such a refrigerator compressor system.

Briefly described, the novel and improved refrigerator compressor system of this invention includes a rotary-type of refrigerator compressor. That type of compressor and an electrical motor for operating the compressor are arranged within a fluid-filled, hermetically-sealed container in a generally conventional manner. In that regard, it is found that when a rotary type of refrigerator compressor is used within such an hermetically-sealed fluid-filled container, operation of the compressor by an electrical motor tends to produce a temperature level within the container which is substantially uniformed throughout all parts of the container. That is, while that temperature is subject to change, such as a rise in temperature on the occurrence of an overcurrent or other fault condition in the system, such a

temperature change tends to be rapidly reflected in a change in said uniform temperature level throughout all parts of the sealed system container. Therefore, in accordance with this invention, a thermal and current-responsive motor protector means of a generally conventional type is mounted within the system container on lead-through pins which extend through the container wall. In that arrangement, the protector is easily and economically connected in the motor circuit and the protector is positioned so it is promptly responsive to a selected rise in the substantially uniformed temperature within the container for protecting the motor against overheating. That is, the thermal response characteristics of the motor protector are selected so it is adapted to interrupt operation of the electrical motor in response to a selected rise in said substantially uniformed temperature which results in a sealed system from operation of a rotary type of compressor within that sealed container, thereby to protect the motor against overheating within the container. Preferably the motor protector is mounted within a motor protector unit which includes a cluster block having means for contacting the respective lead-through pins, having leads and terminals extending from the cluster block for electrically connecting the pins to the motor, and a motor protector element which is mounted on the cluster block to be located in selected position in the system container when the block is mounted on the pins. The use of such a motor protector unit further facilitates convenient and economical assembly of the refrigerator compressor system while assuring proper thermal and current response by the protector for preventing overheating of a motor within the system.

Brief Description of the Drawings

Other objects, advantages and details of the novel and improved refrigerator compressor system and motor protector unit of this invention appear in the following detail description of preferred embodiments of the invention, the detailed description referring to the drawings in which:

Fig. 1 is a partial section view along the longitudinal axis of the refrigerator compressor system of this invention;

Fig. 2 is a partial section view along line 2-2 of Fig. 1 illustrating the motor protector unit of this invention;

Fig. 3 is a schematic view illustrating electrical connection of the motor protection unit of this invention and the refrigerator compressor system of this invention.

Description of the Preferred Embodiments

Referring to the drawings 10 in Figs 1 and 3 indicates the novel and improved refrigerator compressor system of this invention which is shown to include a refrigerator compressor 12 and an electrical motor 14 for operating the compressor which are mounted within an hermetically-sealed container 16. A coolant fluid 18 surrounds the compressor and motor within the container and a plurality of electrically conductive lead-through pins 20, 22 and 24 extend through a wall 16.1 of the container in spaced, electrically-insulated relation to the container and to each other for electrically connecting the motor in an electrical circuit.

In accordance with this invention, the compressor 12 is of a conventional rotary type, that type of compressor having

been found to provide a temperature level within such a fluid-filled hermetically-sealed container which is substantially uniform throughout all parts of the container 16 during normal operation of the compressor 12 by the motor 14 as well as during undesirable increases in that temperature such as might result from operation of the motor during the occurrence of various fault conditions in the compressor system. Preferably for example, the compressor 12 is of a rotary type as described in Handbook - 1983 Equipment, Part III Chapter 12, Published by ASHRAE 1983 and the compressor is arranged to be operated by a conventional electrical motor disposed within the sealed container 16 in a conventional manner. Preferably also the fluid-fill coolant 18 comprises a conventional dielectric coolant fluid such as freon gas or the like which is maintained under pressure within the container 16 in conventional manner. Preferably also, the lead-through pins 20, 22 and 24 are embodied in a conventional fusite cap 26 having the pins secured in openings 26.1 in the cap in sealed, electrically-insulated relation to the cap and to each other by glass-sealing means 28, the cap being welded to the wall 16.1 of the container in conventional manner as indicated at 26.2.

In accordance with this invention, a novel and improved motor protector unit is mounted within the container 16 on the inner ends of the lead-through pins 20, 22 and 24 and is electrically connected in the electrical circuit of the motor 14 to be thermally responsive to changes in said substantially uniform temperature level in the container 16 for protecting the motor against overheating while also

facilitating easy, economical and reliably assembly of the refrigerator compressor system.

Preferably as shown in Figs 1-3, the motor protector unit 30 comprises a cluster block body 32 of a rigid electrical insulating material such as polycarbonate or the like and resilent, electrical contact means 34, 36 and 38 of any conventional type are disposed on the block for resiliently gripping and making electrical connection to the respective lead-through pins 20, 22 and 24. In accordance with this invention, a thermally responsive motor protector element 40 of any conventional type such as the thermal and current-responsive protector shown in U.S. Patent 4,485,231 is mounted on the cluster block body so the motor protector is easily connected in the electrical circuit of the motor 14 and is disposed at a predetermined location in the container 16 to be responsive to said substantially uniform temperature in the container when the unit 30 is mounted on the lead-through pins as described. As the protector 40 is fully described in the noted patent, it is not further described herein and it will be understood that the protector 40 comprises any previously known motor protector element having thermally-responsive means movable within the protector in response to a selected rise in temperature of the thermally responsive means for opening an electrical circuit through the protector, the protector being adapted to be connected in a motor circuit for opening that motor circuit when the thermally responsive means move in response to said selected rise in temperature of the thermally responsive means.

In a preferred embodiment of the invention, the cluster block 32 is formed in two sections 32.1 and 32.2 secured

together by riveting or ultrasonic fusing or the like at 32.3 to form a chamber 32.4. Apertures 32.5 are provided in the block sections to fit over the respective lead-through pins 20, 22 and 24. The resilient contact means are located inside the chamber 32.4 by locating bosses 32.6 for disposing the contact means to resiliently grip the lead-through pins when the pins are inserted through the block apertures 32.5 as will be understood. Preferably the contact means each comprise resilient contact portions 34.1, 36.1, 38.1, welded to relatively rigid contact arms or blades 34.2, 36.2, 38.2 and lead wire means 42, 44 are connected at one end to two of the contact blades 34, 36 respectively to extend from the cluster block. Electrical terminals 42.1, 44.1 carried at the opposite ends of those lead wires are electrically connected to corresponding terminals on the motor 14 as shown in Figs 1 and 3. An additional resilient spring contact portion 38.3 is welded to an additional blade portion 38.4 of the remaining contact means and that blade portion extends from the cluster block through an aperture 32.7 so that the contact spring portion 38.3 resiliently grips and makes electrical connection to a terminal 40.1 of the motor protector outside the cluster block chamber 32.4. An additional lead wire 46 is connected at one end to a second terminal 40.2 of the motor protector and carries an additional terminal 46.1 at its opposite end connected to a corresponding terminal on the electrical motor 14. Preferably locating bosses 32.8 provide detent means 32.9 or the like for engaging the motor protector 40 and cooperating with the resilient contact spring portion 38.3 for detachably mounting the motor protector 40 on the motor protector unit 30.

In that arrangement, the motor protector unit 30 is of an economical structure. It is easily and economically mounted within the container 16 by fitting the cluster block aperture over the pins 20, 22 and 24 for detachably mounting the cluster block on the pins. The motor protector 40 carried on the protector unit 30 is of a conventional type. It is easily provided with a selected actuating temperature to be thermally responsive to a selected rise in a substantially uniform temperature level within the container 16 to interrupt the motor circuit and prevent overheating of the motor if such a rise in temperature should result from the occurrence of a fault condition in the motor or the refrigerator compressor system. The motor protector unit is easily and economically connected in the electrical circuit of the motor 14. The motor protector 40 is also easily and economically incorporated in that electrical circuit for interrupting the motor operation in response to such a selected rise in the temperature within the system container.

It should be understood that although particular embodiments of the refrigerator compressor system and motor protector unit of this invention have been described by way of illustrating the invention, this invention includes all modifications and equivalence thereof falling within the scope of the appended claims.

CLAIMS:

1. A refrigerator compressor system having a compressor and an electrical motor for operating the compressor arranged within an hermetically-sealed, fluid-filled container, having a plurality of electrically conductive pin means extending through a wall of the container in sealed relation to the wall and in spaced, electrically-insulated relation to the wall and to each other for electrically connecting the motor in an electrical circuit, and having motor protector means connected in the electrical motor circuit within the container to be thermally responsive to a selected rise in temperature for interrupting operation of the motor to prevent overheating of the motor on the occurrence of fault conditions in the system, characterized in that the compressor is of the rotary type the operation of which by the motor provides a temperature within the sealed, fluid-filled container which is substantially uniform throughout all parts of the container, and in that the motor protector means is mounted on the pin means to be thermally responsive to rise in said substantially uniform temperature to said selected temperature for interrupting motor operation to prevent overheating of the motor.

2. A refrigerator compressor system as set forth in claim 1 further characterized in that the motor protector means comprises a cluster block connector body of an electrical insulating material, contact means mounted on the body for resiliently engaging the pin means to resiliently grip and make electrical connection to the respective pin means, a motor protector element mounted on the body to be

Claim 2 continued

thermally responsive to rise in said substantially uniform temperature to said selected temperature for interrupting motor operation, and lead means electrically connecting the motor protector and the contact means to the motor for electrically connecting the motor in said electrical circuit.

3. A motor protector unit for use in a refrigerator compressor motor system having a compressor of the rotary type and an electrical motor for operating compressor arranged with in an hermetically-sealed, fluid-filled container and providing a temperature within the sealed, fluid-filled container which is substantially uniformed throughout all parts of the container, having a plurality of electrically conductive pin means extending through a wall of the container in sealed relation and in spaced, electrically insulated relation to the wall and to each other for electrically connecting the motor in an electrical circuit, and having motor protector means connected in the electrical motor circuit within the container to be thermally responsive to a selected rise in temperature for interrupting operation of the motor to prevent overheating of the motor on the occurrence of fault conditions in the system, the motor protector unit comprising a cluster block body of an electrical insulating material, contact means mounted on the body for resiliently engaging the pin means to resiliently grip and make electrical contact to the respective pin means for holding the motor protector unit on the pin means, a motor protector element mounted on the cluster block body to be thermally responsive to a selected rise in said substantially uniform temperature within the container for interrupting motor operation to prevent overheating of the motor, and lead means electrically connecting the motor protector and the contact means to a motor for electrically connecting the motor in an electrical circuit.

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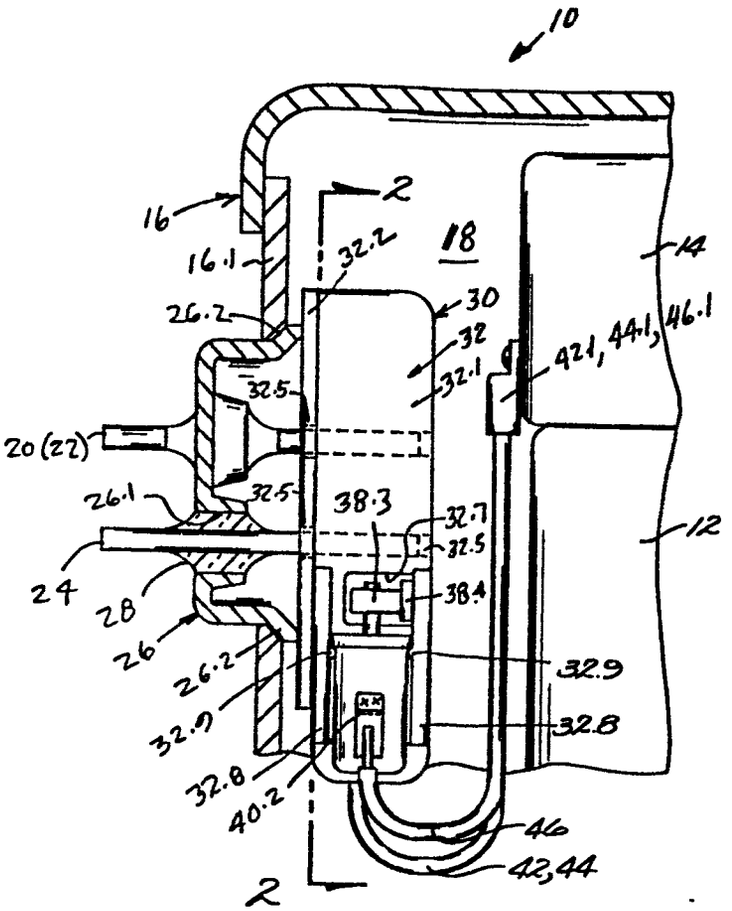

Fig. 1.

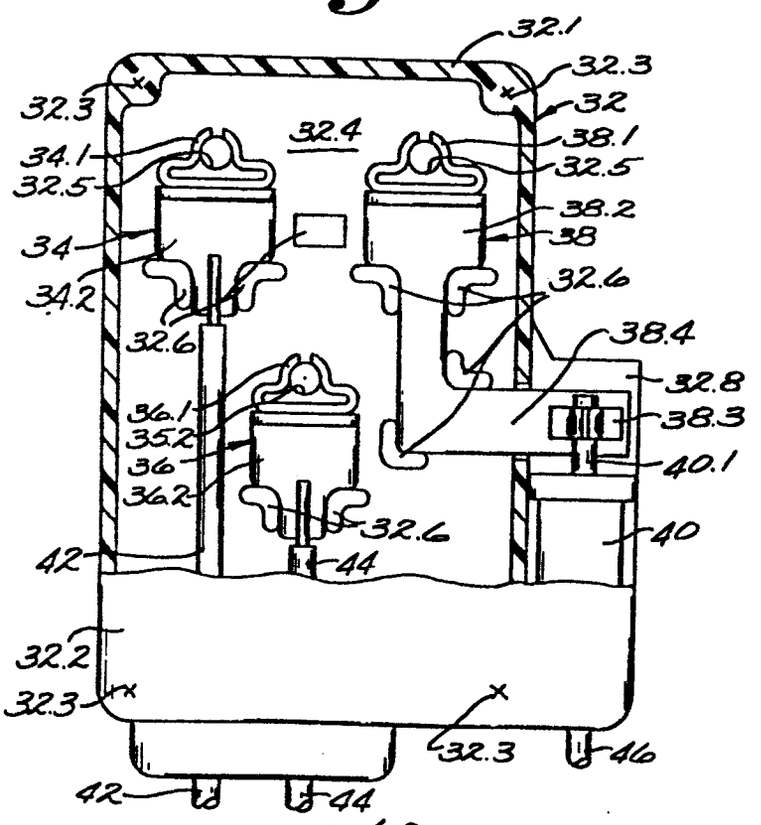

Fig. 2.

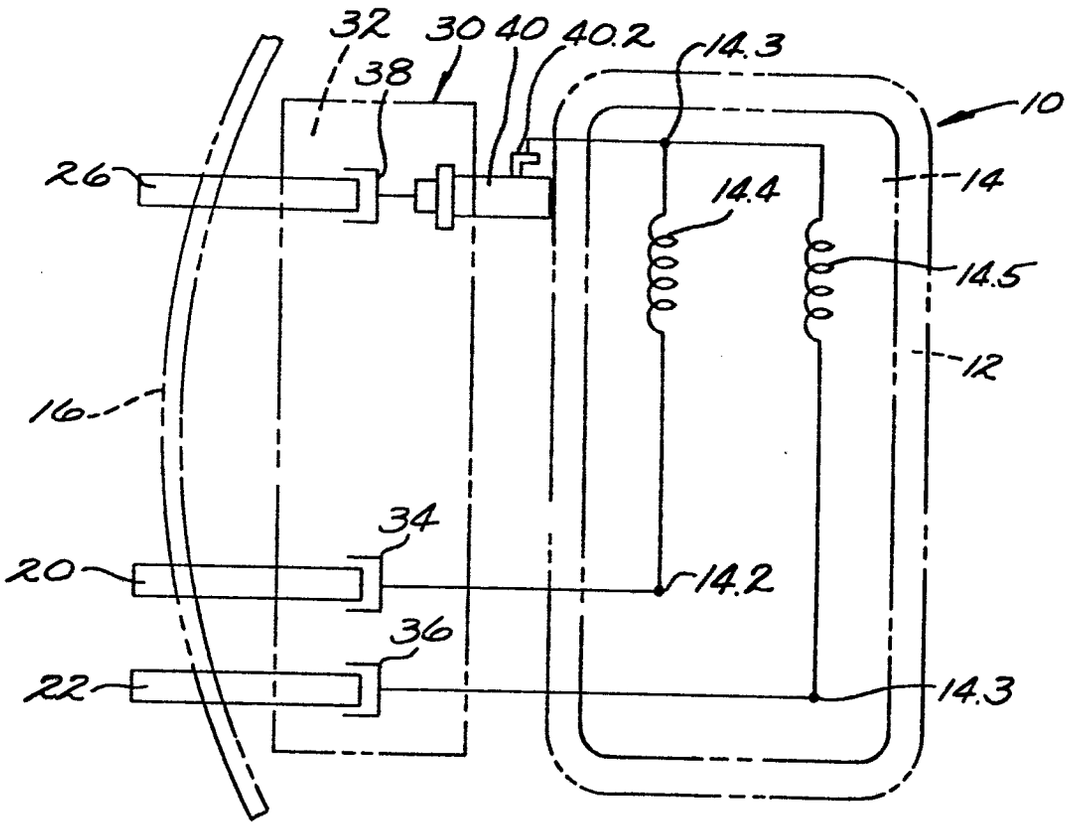

Fig. 3.