Oct. 27, 1936. F. J. HEIDEMAN 2,058,872

REFRIGERATING APPARATUS

Filed June 2, 1932

Fig. 1.

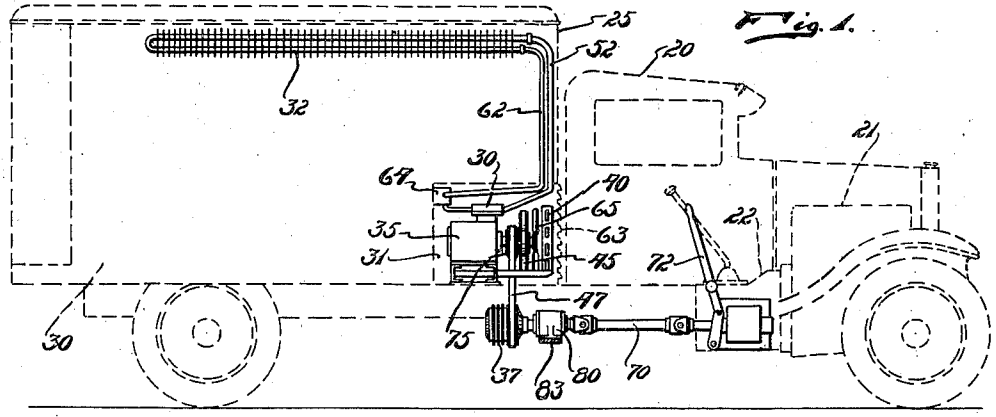


Fig. 2.

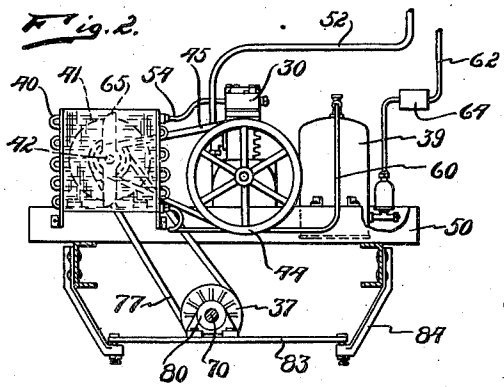


Fig. 3.

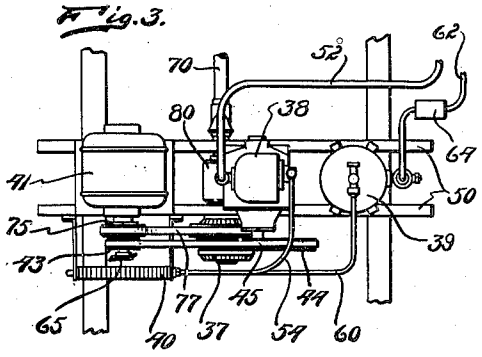


Fig. 4.

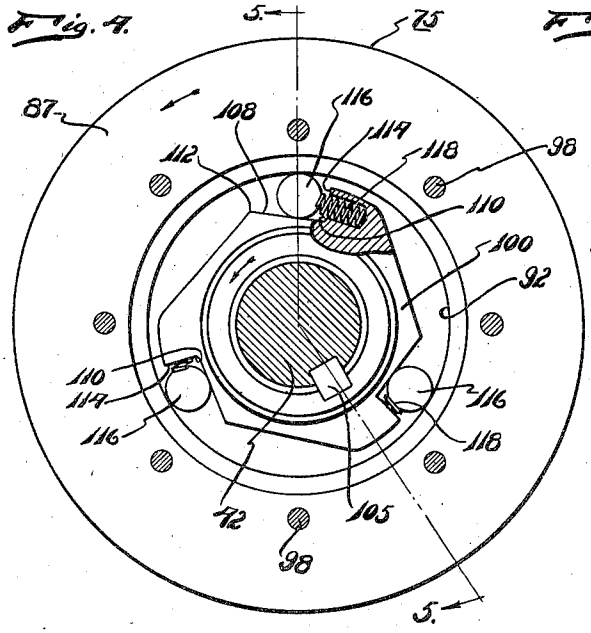
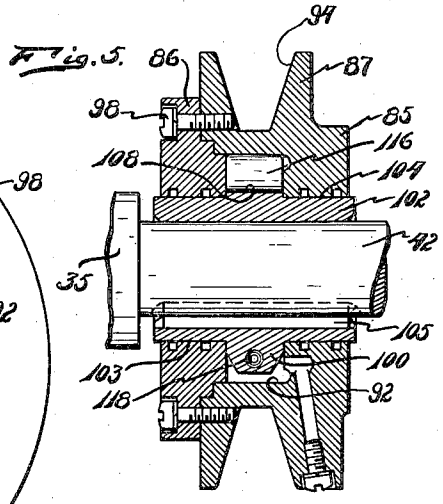


Fig. 5.



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REFRIGERATING APPARATUS

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Application June 2, 1932, Serial No. 614,956

1 Claim. (Cl. 62—117)

This invention relates to refrigerating apparatus and particularly to refrigerating apparatus for refrigerating vehicles.

One of the objects of my invention is to provide refrigeration for trucks or other vehicles in an improved and efficient manner.

Another object of my invention is to provide for refrigerating a vehicle by refrigerating apparatus of the compression type and to arrange for operating the compressor of such apparatus in an economical and improved manner.

Another object of my invention is to provide continuous refrigeration for a vehicle by providing an electric motor for operating the compressor during periods when the vehicle is not in operation and to provide improved driving means for transmitting power from a source associated with the vehicle to the compressor for driving the compressor when the vehicle is in operation, and to arrange said driving mechanism in such a manner so that it is ineffective when the compressor is being operated by said electric motor.

Another object of my invention is to provide a refrigerating apparatus of the compression type for refrigerating a vehicle and to arrange for operating the compressor of such apparatus through the medium of a speed regulator which in turn is operated by a source of power associated with the vehicle or by an electric motor during periods when the vehicle is not in operation and to arrange the driving connection between said regulator and the compressor in such a manner so as to prevent the transmission of power from the compressor to said regulator during periods when said compressor is being driven by said electric motor.

Another object is to provide a fan for cooling a condenser of the aforesaid refrigerating apparatus and to arrange for operating said fan by the electric motor during periods when the compressor is being operated by said motor and to arrange for operating said fan and compressor by a source of power associated with the vehicle during periods when the vehicle is in operation, and further to provide a driving connection between said source of power and said fan which permits said source to operate the compressor but which is ineffective to transmit power from said electric motor to said source of power when the compressor is being operated by said electric motor.

Other objects and advantages of the present invention will be readily apparent from the following description and by reference to the accompanying drawing.

In the drawing:

Fig. 1 is a view indicating diagrammatically a refrigerating system in connection with a motor vehicle constructed in accordance with my invention;

Fig. 2 is an enlarged side view of a portion of the refrigerating system removed from the vehicle;

Fig. 3 is a top plan view of the refrigerating apparatus shown in Fig. 2;

Fig. 4 is a view partly in elevation and partly in cross section of a clutch mechanism embodying features of my invention; and

Fig. 5 is a view in cross section taken along the line 5—5 of Fig. 4.

Referring to the drawing, the numeral 20 designates any suitable motor vehicle operated by motor 21 and includes the usual transmission 22. The truck is provided with a body portion 25 divided into an insulated refrigerating compartment 30 and a machinery compartment 31. The vehicle carries a refrigerating system diagrammatically represented as including a cooling or evaporating unit 32 located in the refrigerating compartment, and in the machinery compartment there is located a condensing unit 35 which is adapted to be operated by the motor 21 at a substantially constant speed through the medium of a hydraulic speed regulator 37 not described in detail herein but fully described and claimed in the copending application of Frank O. Graham entitled "Refrigerating apparatus", Serial Number 601,505, filed March 28, 1932.

Referring more in detail to the drawing, the condensing unit 35 may be of any suitable type and as herein shown includes a compressor 36, liquid refrigerant receiver 39, condenser 40 and electric motor 41. The motor 41 is provided with a shaft 42 on which is mounted a pulley 43. The compressor 36 is provided with a flywheel pulley 44. The pulleys 43 and 44 are encircled by a belt 45 which serves to drive the compressor during periods when the motor 41 is being operated. These parts are all mounted upon an angle iron base 50 which is supported by the chassis frame of the vehicle in compartment 31. The compressor withdraws refrigerant vapor from the evaporator through a vapor conduit 52, compresses the vapor and through a conduit 54 delivers it to the condenser 40 wherein it is liquefied and from which it is delivered through conduit 60 to the receiver 39. Liquid refrigerant is supplied to the evaporator from the receiver through a

liquid supply conduit 62 under the control of an expansion valve 64.

The machine compartment 31 is provided with a louvered front panel 63 and an opening in the lowermost part thereof to permit the free circulation of air therethrough. Such a circulation of air is utilized for cooling the condenser and to remove heat generated in the compartment 31. For the purpose of creating a sufficient flow of air a fan 65 is provided. Preferably this fan is mounted on the armature shaft 42 of the motor 41. This fan is arranged to be operated by the motor 41 when the motor is operating the compressor and is adapted to be operated by power received from the vehicle motor during periods when the vehicle motor is in operation and in a manner hereinafter described. During periods when the vehicle motor is employed for operating the compressor and fan 65, the armature and its shaft of motor 41 rotate merely to drive the fan 65.

During periods when the compressor is operated by the motor of the vehicle, the motor 41 is unnecessary. However, in the event it is desired to refrigerate the compartment 30 when the vehicle motor is not in operation, for instance over night when the vehicle is in the garage, the motor 41 may be connected to the usual electric source of supply in the garage for operating the compressor.

The refrigerating system is preferably intermittently operated and is adapted to maintain substantially constant temperatures in the compartment 30. Any suitable means such as a thermostatically controlled electric switch (not shown) responsive to changes in temperature within the compartment 30 may be used to close and open the motor circuit for controlling the on and off phases of the refrigerating cycle of the system when the motive power is the motor 41.

As shown in the drawing, the hydraulic regulator 37 is connected to the vehicle motor by a power take off shaft 70 which is adapted to be moved into and out of engaging with the transmission 22 by lever 72 as desired.

In order to provide a suitable driving connection between the hydraulic regulator 37 and the compressor 38, I have provided a slipping or overrunning clutch mechanism 75 which is mounted preferably upon the armature shaft 42 of the motor 41. This clutch mechanism is operatively connected to the regulator 37 by means of a belt 77 while the driving connection between the armature shaft 42 and compressor 38 is as previously described through belt 45. The clutch mechanism 75 is of the type which permits the compressor 38 to be operated during periods when the vehicle motor 21 is in operation through the medium of the speed regulator 37 and belts 77 and 45 but is arranged in such a manner so as to prevent the transmission of power from the motor 41 to the speed regulator 37, power take off shaft 70 or to the motor 21 through its transmission 22 during periods when the electric motor 41 is being operated to drive compressor 38. This provides a one direction driving connection between the vehicle motor and the compressor. By this arrangement the motor 41 may be operated to drive compressor 38 without utilizing additional electric energy which would otherwise be required if the motor 41 were required to operate the speed regulator 37. Another important advantage of such an arrangement is that the possibility of damage to the engine transmission is avoided by reason of the fact that the regulator 37 and shaft 70 remain stationary during periods when the motor 41 is operating the compressor. This danger may occur in the event the lever 72 should inadvertently be left in such a position so that the power take off shaft 70 would be in engagement with the transmission 22.

The regulator 37 is located on the exterior of the truck and the regulator end of the shaft 70 is supported in a suitable bearing box 80. This bearing box not only provides an adequate support for the regulator 37 but also permits the shaft 70 to rotate with only a negligible amount of friction. The bearing box 80 is mounted upon a supporting frame 83 carried by brackets 84 depending from the chassis frame of the vehicle.

In order to provide proper refrigeration within the compartment 30 when the compressor is operated by the vehicle motor, any suitable signal device such as a thermostatically controlled light or thermometer (not shown) responsive to changes in temperature in compartment 30 may be located on the dash board or other conspicuous place on the vehicle to notify the operator of the vehicle when to engage and disengage the shaft 70 with the transmission.

The clutch mechanism 75 which forms a part of the driving connection between the regulator 37 and compressor 38 comprises in general a casing 85 formed preferably by two castings 86 and 87. The casting 87 is recessed to provide a cylindrical chamber 92 and is also provided with a V shaped pulley 94 formed integral therewith on the outer periphery thereof. The casting 86 forms one wall of the chamber 92. The castings 86 and 87 are rigidly secured together by screws 98.

Within the chamber 92 there is disposed a rotor 100 formed preferably integral with a bushing or bearing member 102 which extends through openings 103 and 104 provided in castings 86 and 87 respectively. The bearing member 102 is rigidly secured to the armature shaft 42 by key 105.

The rotor 100 is provided with a plurality of bearing surfaces 108. As shown in Fig. 4 the ends 110 of bearing surfaces are located in closer proximity to the axis of shaft 42 than ends 112. It will also be noted in Fig. 4 that the rotor is provided with a plurality of shoulders 114 at the ends 110 of bearing surfaces 108. Between each bearing surface and the cylindrical wall portion of chamber 92 I have disposed a roller bearing 116 and in each shoulder 114 I have placed a coiled spring 118. One end of each spring is arranged to engage a roller and tends to urge the roller away from the shoulder for the purpose about to be described.

During operation of the vehicle motor the casing 85 is rotated in the direction of the arrow shown in Fig. 4. When this occurs the rollers will be moved along the angular bearing surfaces 108 until the rollers contact the cylindrical wall of chamber 92. When this takes place the rollers become locked between the cylindrical wall and the bearing surface 108. This locks the rotor to the casing 85 and provides a driving connection between the regulator 37 and the armature shaft 42, while the pulley 43, belt 45 and flywheel pulley 44 provide a driving connection between the armature shaft 42 and the compressor 38. During periods when the motor 41 operates the compressor 38, the rotor 100 which is actuated by shaft 42 of motor 41 will be driven in the direction of the arrow shown in Fig. 4, and at this time the roller bearing members 116 will be moved toward the shoulder 110 against the action of springs 118. When this occurs, the rollers 116 will be out of engagement with the cylindrical wall surface of chamber 92 to thus permit the free rotation of

rotor 100 without transmitting power to the casting 90. Consequently no power will be transmitted from the motor 41 to the speed regulator 37. The tension of springs 118 is very slight and although they tend to urge the roller bearings away from the shoulder 110 and into engagement with the cylindrical wall surface of the chamber 92, such contact is but slight and insufficient for locking the rotor to the casting 90 by means of the bearings 116.

As shown in Fig. 5 the casting 90 is drilled as at 122 to provide a passage to the chamber 92 for the admission of lubricant. Any suitable lubricating substances may be used such, for instance, as grease. In order to provide adequate space within the chamber 92 so that a large amount of lubricating substance may be admitted thereto through the passage 122, I have provided cut away portions 124 on the rotor 100 which provide a considerable clearance between the rotor and the cylindrical wall surface of the chamber 92. In the event grease is used as the lubricating medium, it has been found that by the use of springs 118 the rollers 116 do not become pocketed adjacent the shoulder 114 of rotor 100 should the grease become congealed. In order to provide for lubricating the surfaces between the bushing 102 and castings 86 and 87, each of these castings have been provided with a plurality of annular grooves 126 which may be packed with grease when the device is assembled and additional lubrication is supplied thereto by capillary attraction from the chamber 92. Also in the event grease is injected into the chamber 92 through the passage 122 under high pressure, some of said grease will be forced into the annular grooves at that time.

Although I have shown my improved clutch mechanism 75 carried by the armature shaft 42 of the motor 41, it is readily apparent that such clutch mechanism may readily be carried by the compressor operating shaft to obtain the advantages embodying my invention.

Although only a preferred form of the invention has been illustrated, and that form described in detail, it will be apparent to those skilled in the art that various modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claim.

What I claim as my invention is:

Refrigerating apparatus comprising a vehicle, a transmission, an engine for driving said vehicle through said transmission, a refrigerating system on said vehicle including a refrigerant circulating device, an electric motor, mechanical driving means for driving said device from said vehicle transmission, comprising, a power take-off shaft from the transmission of the vehicle, a speed regulator connected with said shaft, a belt pulley on said speed regulator, an over-running clutch and pulley on the shaft of said electric motor, a belt between said pulleys for driving the shaft of said electric motor from said speed regulator pulley when said vehicle is moving, a driving pulley secured rigidly on the shaft of said electric motor, a driven pulley on said refrigerant circulating device and a belt between said driving and said driven pulleys whereby the refrigerant circulating device may be driven from the vehicle power take-off through the motor shaft, or independently by the electric motor without driving any part of said speed regulator.

FRED J. HEIDEMAN.