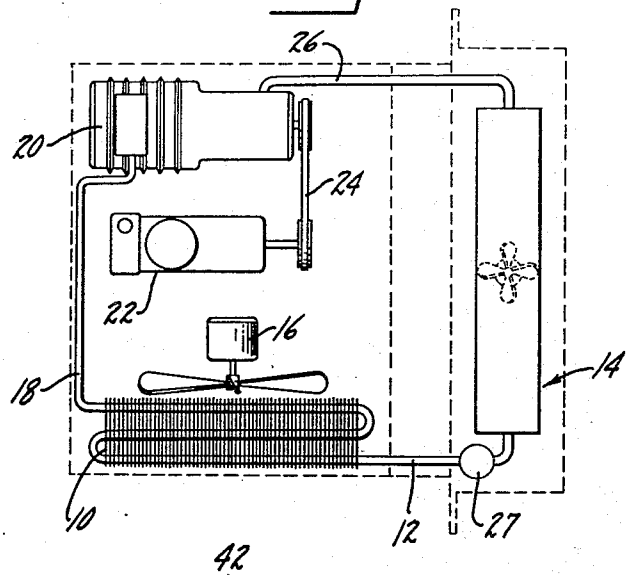
June 1, 1965 H. W. KLEIST 3,186,186

AIR CONDITIONING UNIT FOR VEHICLES

Filed July 12, 1963

Fig. 1.



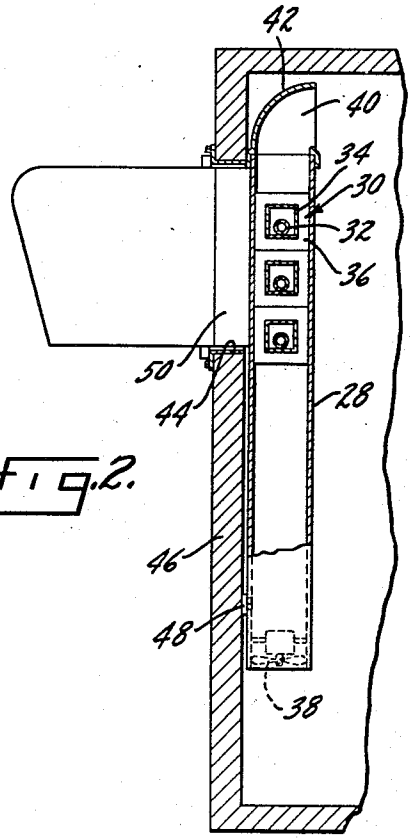


Fig. 2.

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AIR CONDITIONING UNIT FOR VEHICLES

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1 Claim. (Cl. 62—263)

This invention relates to a self-contained unitary refrigeration system for use in vehicles, and has for a primary purpose a lightweight unit of this type in which the heat exchange assembly and the condensing assembly are a single unit mounted on opposite sides of an insulating bulkhead partition.

Another purpose is a self-contained refrigeration unit of the type described in which the condensing assembly and heat exchange assembly are generally balanced in weight.

Another purpose is a self-contained refrigeration assembly of the type described in which the condensing assembly extends through an aperture in the vehicle, with the aperture being generally the size and shape of the insulating bulkhead between the condensing assembly and the heat exchange assembly.

Another purpose is a self-contained completely assembled refrigeration unit of the type described which may be quickly and easily attached for use in a vehicle.

Another purpose is a refrigeration unit of the type described including an internal combustion engine positioned within the condensing assembly for driving the same.

Other purposes will appear in the ensuing specification, drawings and claims.

The invention is illustrated diagrammatically in the following drawings wherein:

FIGURE 1 is a diagrammatic illustration of the refrigerant system, and

FIGURE 2 is a vertical section through the refrigeration assembly shown in FIGURE 1.

In FIGURE 1, a conventional refrigeration system is shown to include a condenser **10** which supplies refrigerant through a duct **12** to the heat exchange assembly indicated generally at **14**. A suitable fan or the like **16** may be positioned to direct cooling air over the condenser **10**. A line **18** may carry the compressed refrigerant, which may be any one of a number of suitable types of refrigerants, from a compressor **20** to the condenser **10**. The compressor **20** may be driven in any suitable manner. One satisfactory drive arrangement includes an internal combustion engine **22** positioned within the condenser assembly and connected by a suitable belt or the like **24** to the compressor **20**. A small diesel is a satisfactory type of internal combustion engine, although the invention should not be limited thereto, as gas engines are also satisfactory. In some applications the compressor may be driven from the vehicle drive, assuming that the vehicle is a truck. In other applications the compressor may be driven from an axle of the vehicle. A line **26** carries the refrigerant from the heat exchange assembly **14** to the compressor **20**. An expansion valve or the like **27** may be positioned just ahead of the heat exchange assembly to permit the compressed cooled refrigerant to expand prior to taking on heat with the heat exchange assembly.

The heat exchange assembly **14** may include a somewhat rectangular-shaped housing **28** mounting a group of what may be termed finned coils indicated at **30**. The coils may either be connected in series or in parallel, but all of them will receive cooled compressed refrigerant from the line **12** and will discharge the refrigerant through line **26**. Each of the coils **30** may include a generally central duct or pipe **32** which contains the

volatile refrigerant. In the preferred form the duct **32** may be surrounded by a housing or enclosure **34**, which may be generally square in cross section, with the space within the housing and around the duct **32** being filled with a suitable eutectic substance. Fins or the like **36**, which again may be square in shape, although this is not necessary, are positioned on the outside of the housing **34**. The fins are spaced to provide passages for the air to be cooled. At the bottom of the housing **28**, I may provide a suitable fan or the like **38** which is effective to draw air into the bottom open end of the housing **38** and move it past the cooling coils and then out an upper discharge opening **40**. The top of the housing, indicated at **42**, may be somewhat curved or arcuate to direct the air from the opening **40** out into the space to be cooled.

The refrigeration unit shown is adapted for use in any one of a number of vehicles. It may be used in railroad cars, trucks of the large overland type, or smaller trucks designed for delivery use. The term "vehicle," as used herein, is meant to include use in any one of these or similar units.

As illustrated in FIGURE 2, the condenser assembly may extend through an opening **44** in the wall **46** of a vehicle. It is not necessary to attach the unit to a wall of a vehicle and it may be satisfactorily attached to the floor or the ceiling. It is preferred, however, to attach the heat exchange assembly housing **28** to the interior of the wall **46** by means of brackets or the like **48** with the condenser housing extending through the opening or aperture **44**. In this connection, the opening **44** should be generally the same in size and shape as the condenser housing, as normally the unit will be installed from the inside of the vehicle. A partition or the like **50** which may be of suitable insulating material is mounted between the heat exchange assembly housing **28** and the condenser assembly with the partition being of a size and shape to completely fill the opening **44** to seal the interior of the space to be cooled.

Of the particular importance is the weight relationship between the heat exchange assembly and the condenser assembly. It is preferred that the weights of these two units be generally equal or balanced so as to prevent excessive strain on the wall **46**. When one or the other of these two units is substantially heavier than its counterpart, there may be severe bending or torsion applied to the wall **46**. It is preferred, as illustrated in FIGURE 2, to have the heat exchange assembly **28** positioned completely above the floor to do away with a floor support. This is not necessary and in some applications the unit may extend to the floor.

The use, operation and function of the invention are as follows:

The self-contained refrigeration unit shown is particularly advantageous in that all the refrigeration connections can be made in the factory. The unit, completely assembled, may be installed in any type of vehicle with relative ease. An opening is formed for the condenser assembly and the unit is then moved in and attached to the wall with the condenser assembly extending out through the opening. The insulating bulkhead partition **50** is of a size and shape to close the aperture formed in the vehicle wall to provide a completely sealed space for perishables or other material to be cooled.

Of importance is the relative weights between the two units on opposite sides of the insulating bulkhead. It is preferred that these weights be substantially in balance to avoid excessive strain on the intermediate wall.

Of importance is the fact that the entire refrigeration system may be both quickly installed and quickly removed. In this way trucks may be adapted for differing

uses and it is not necessary to have the refrigeration system as an integral part of the truck.

As shown in the drawings, the finned coils which cool the air passing through the heat exchange assembly include a container for an eutectic. Such a so-called "hold-over" provides cooling even when refrigerant is not passing through the coils. It is not always necessary to have an eutectic with a refrigeration system of this type. In some units, particularly those which are self-contained to the extent that an internal combustion engine in the condenser assembly furnishes the drive, an eutectic may not be necessary. In other systems in which the refrigeration system is driven from either the vehicle motor or from a vehicle axle, it may be advantageous to provide a "hold-over" or eutectic.

The drive for the unit may vary, although it is preferred, in line with the concept of having the system self-contained, to provide an internal combustion engine, for example a diesel, within the condenser assembly.

In some applications, it may be advantageous to provide a second coil, in parallel with the first coil, but adapted for use as a heater. The second coil may contain a suitable heated fluid from a separate source. The heater may be used as a method of temperature regulation in cooperation with the cooling coil or may be used to heat the vehicle interior.

Whereas the preferred form of the invention has been shown and described herein, it should be realized that there are many modifications, substitutions and alterations thereto within the scope of the following claim.

I claim:

An easily insertable and removable refrigeration unit for storage housings, said refrigeration unit including, in combination,

a condenser assembly,

said condenser assembly being of a size sufficient to be passed outwardly through an aperture in a substantially planar wall from the interior of a storage housing,

a heat exchange assembly,

said heat exchange assembly being operatively connected to and movable with the condenser assembly to thereby form a self-contained unit,

said heat exchange assembly being of a substantially greater cross-sectional area than the condenser assembly to which it is connected,

said heat exchange assembly including an evaporator,

said evaporator being substantially longer and wider than it is thick,

said evaporator being so disposed with respect to the condenser assembly that the minimum thickness of the evaporator is disposed substantially perpendicular to the planar wall to which the assembly is mounted,

said evaporator including air moving means for circulating air in the plane formed by one of the two longest dimensions of the evaporator, and substantially transversely to the minimum dimension of the evaporator,

whereby entrance and exit of air from the evaporator occurs at remote locations and moves along a substantially undeviating path from entrance to exit,

the major portion of said path lying substantially parallel to the wall adjacent the evaporator.

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