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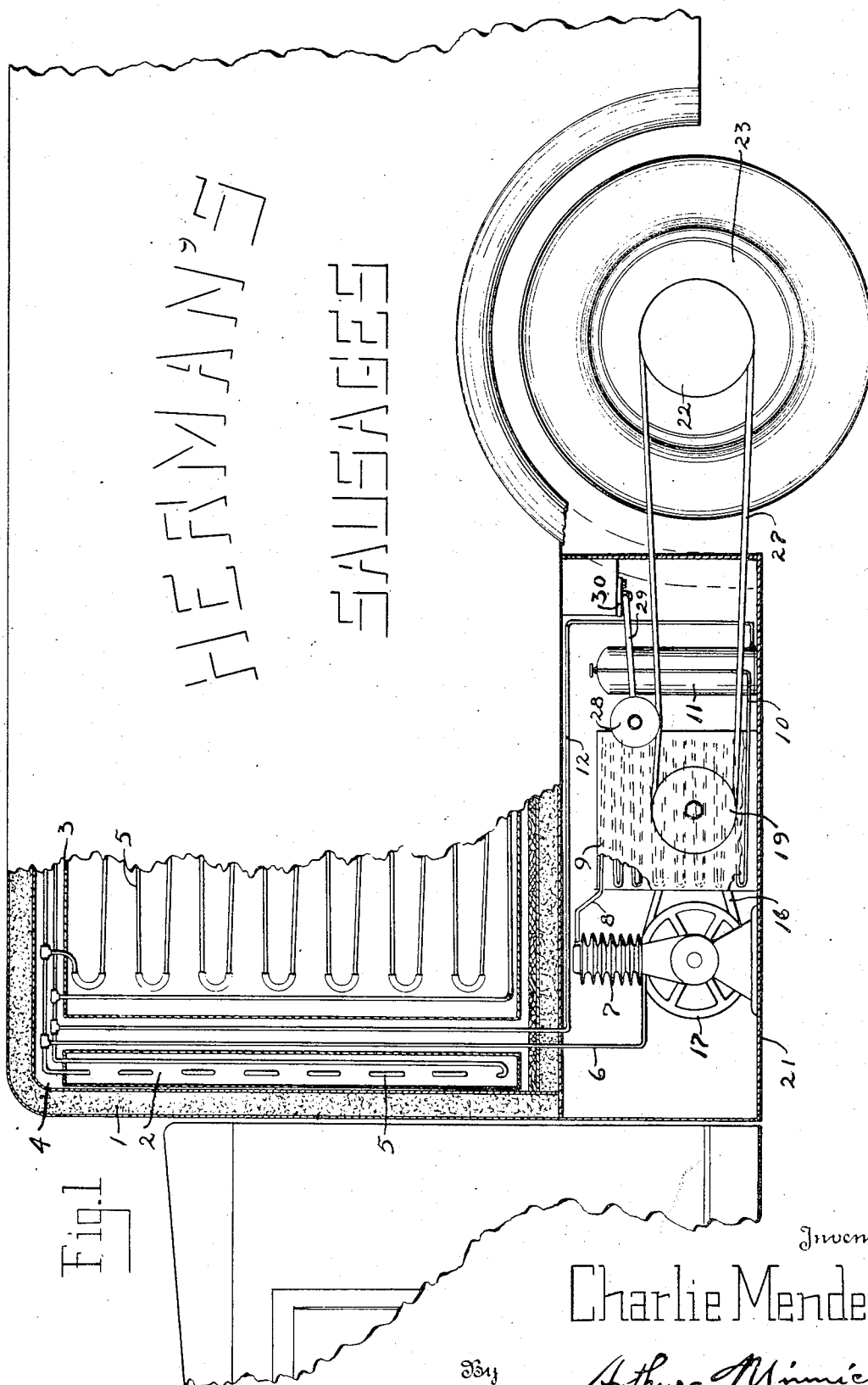
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REFRIGERATION APPARATUS FOR TRUCKS AND TRAILERS

Filed Oct. 17, 1938

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

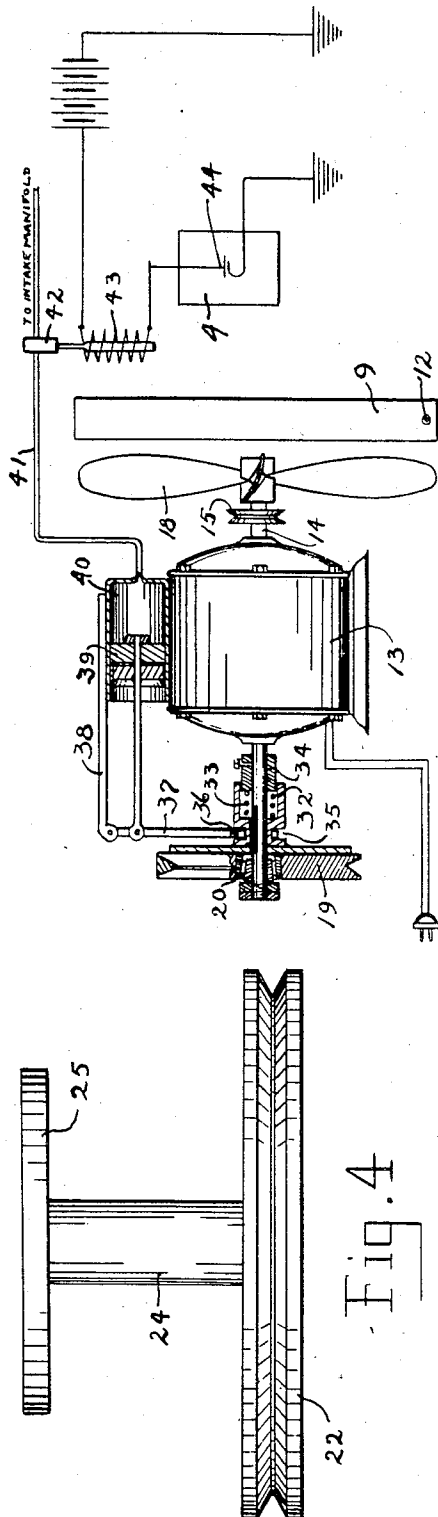


Fig. 4

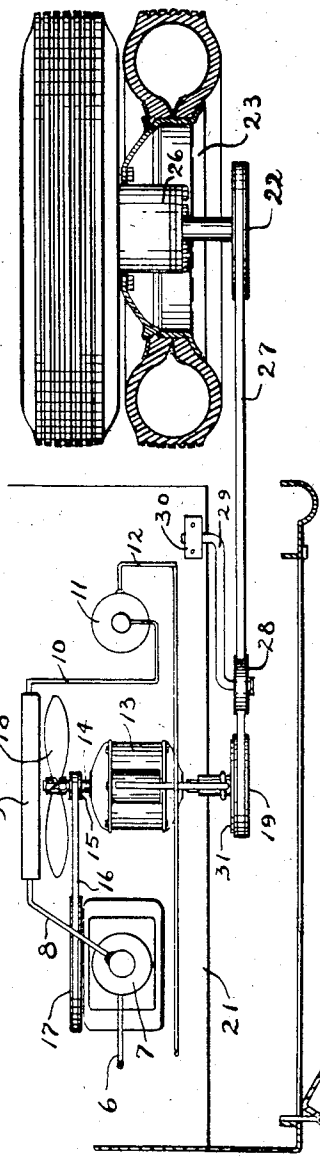


Fig. 3

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3 Claims. (Cl. 62—6)

This invention has for its principal object to provide means by which a truck or trailer may be kept refrigerated at all times, the power needed for operating the refrigerating apparatus while the vehicle is in motion being derived directly from the rotation of the supporting wheel most conveniently located with respect to the driven mechanism. To this end, the system comprises an insulated storage chamber, a low-temperature liquid tank within the chamber, a liquefied-gas circuit having a portion in an expansion unit within the low-temperature tank, a gas compressor within the gas circuit mechanically connected with one or more of the supporting wheels of the vehicle for operation thereby while the vehicle is in motion and having means for operating the compressor when connected to an independent source of power when the vehicle is at rest.

A further object of the invention is to provide means for disconnecting the gas compressor motor from its mechanical connection with the vehicle wheel when the refrigeration chamber reaches a predetermined point of temperature.

Other objects of the invention will appear in connection with the description of a preferred embodiment illustrated in the accompanying drawings, in which Figure 1 is a side elevation with parts broken away and parts in section of a refrigerated truck having the mechanism for compression of the gas located below the left side of the front portion of the truck; Fig. 2 is a side elevation of the motor for the gas compressor with the drive pulley and its clutch and clutch operating means shown in section, and with a wiring diagram to indicate the manner in which a thermostat may control the clutch; Fig. 3 is a plan view of the portion of the gas compressing mechanism beneath the truck with one of the supporting wheels of the vehicle shown in section; and Fig. 4 is a plan view on a larger scale of the drive pulley for the wheel.

Refrigerator trucks for the transportation of perishable foods are usually provided with a well insulated refrigerating chamber having an expansion unit therein for the evaporation of a refrigerant liquid such as methyl chloride or sulfur dioxide, and pipes lead the expanded gas to a compressor and condenser where the gas is liquefied and returned to the expansion unit through a suitable expansion valve. To operate the compressor, an electric motor is usually provided and when the truck is standing still, this electric motor may be connected to any source of electric current. This apparatus is efficient for

lowering the temperature within the refrigerating chamber while the truck is at either end of the run, but when the truck is being driven long distances in warm weather, the temperature of the chamber frequently rises to a point at which deterioration of the food in the chamber becomes serious.

To reduce the hazard of damage to the articles to be refrigerated, many devices have been used by which the operation of the compressor is continued while the truck is travelling along a highway. Where the motor that operates the vehicle is used as the means for driving the compressor, there is usually an expensive and heavy power take-off shaft and transmission, or a gear or sprocket chain, jack shaft and clutch mechanism interposed between the propeller shaft and the compressor. Such devices are obviously capable of use only upon a truck and are not readily applied to a trailer.

When a separate internal combustion motor is mounted on the truck to operate the refrigeration unit, it is not only heavy and expensive but has added danger as a fire hazard.

The mechanism illustrated herein may be readily applied to almost any truck or trailer having a suitably insulated refrigeration chamber. The compression mechanism is driven by an electric motor from the local source of current when the vehicle is being loaded or unloaded, and when the vehicle is travelling on its way, the motor shaft is driven mechanically through a belt running over pulleys on the motor shaft and on the end of the rear axle.

In the drawings, the truck is shown as having an insulated wall 1 with brine tanks 2 and 3 on the end and side of the refrigeration chamber 4. Within these tanks, are expansion coils 5 which are supplied with a refrigerant liquid consisting of a liquefied gas such as is used in domestic refrigerators for taking up heat by the vaporization of the volatile liquid.

From the coils, the gas is drawn through a return pipe 6 to the compressor 7 which compresses the gas and delivers it through pipe 8 to the condenser 9. Here it is liquefied and passes through the pipe 10 to the receiver 11. Liquid from the receiver 11 passes out through the pipe 12 to the coils 5, to complete the familiar refrigeration cycle.

The brine within the tanks 2 and 3 loses heat as the gas evaporates in the coils and provides a large mass at a low temperature to absorb heat from the chamber at times when the liquid refrigerant may not be in circulation.

An electric motor 13 has on its shaft 14 a pulley 15 for a belt 16 which passes around the pulley 17 on the shaft of the compressor. A fan 18 is also on the shaft 14 to draw air through the coils of the condenser 9. On the other end of the shaft 14, is mounted a pulley 19, preferably having a roller bearing 20. This pulley 19 projects beyond the outer edge of the shelf 21 on which the motor 13, compressor 7, condenser 9 and receiver 11 are mounted and lies in the same plane with the pulley 22 secured upon the rear wheel 23 of the truck or trailer. This pulley 22 has a shaft 24 formed with a flange 25 which is bolted on the hub 26 of the supporting wheel 23. A belt 27 extends around the pulleys 19 and 22 and is maintained under sufficient tension by an idler pulley 28 on an arm 29 pivoted in a bracket 30 on the body of the vehicle.

In travelling along a highway, there is a certain relative up and down movement of the wheels toward and from the body as the springs flex and rebound, but any change in the distance between the pulleys 19 and 22 is provided for by making the belt loose enough for the greatest possible separation and by the use of the idler pulley 28. The tension will remain substantially constant since the idler pulley will rise and fall with the change in position of the pulley 22 without change in its effective weight.

A clutch member 31 slidable but not rotatable on the shaft 14, is normally held in close frictional contact with the inner face of the pulley 19 by a spring 32 held within the hub 33 of the member 31 and bearing with one end against the hub and at its other end against an adjustable sleeve 34. The hub 33 has a yoke-groove 35 for the yoke 36 at one end of a lever 37 pivoted on a bracket 38 and actuated by a piston 39 in a vacuum cylinder 40 connected by a tube 41 with the intake manifold of the engine of the truck. If used on a trailer, a suitable flexible suction pipe would be provided on the truck with which the trailer was to be used.

A valve 42 controlled by a solenoid 43 in the electric circuit of a thermostat 44 within the chamber 4, acts to open the valve 42 of the tube 41 to cause suction within the chamber or cylinder 40 to withdraw the clutch member 31 from contact with the pulley 19 when the temperature in the chamber 4 reaches a predetermined low point for which the thermostat is set.

It will be seen that the pulley element 22 may have its flange 25 adapted to be held upon the hub by the same bolts that are normally used to hold the rear axle in place, or at least will have the bolt holes in the flange in the proper position to receive slightly longer bolts, so that no modification or change needs to be made in the construction of the wheel, and similarly, the clutch and pulley on the electric motor shaft can be installed in place with very little machine work. The entire cost of the pulley and belt drive is very low as compared with the elaborate power take-off devices hitherto proposed for the same purpose.

When the vehicle is at the end of its run and it is desired to drive the refrigerant compressor by the use of the motor 13, the belt 27 can easily be lifted off the pulley 19 to permit it to run freely. It will be understood that the invention is not limited to any special form of compressor, motor, condenser, clutch, or thermostat, since

these may be chosen to suit the conditions, and it is also evident that the invention is not limited to the exact form of expansion apparatus within the refrigeration chamber though there are many advantages in the use of the brine tanks described.

The claims are therefore to be construed broadly as defining devices capable of carrying out the objects set forth and comprising parts and combinations of parts as specified in the claims.

I claim:

1. In a refrigerating system, in combination, a motor-driven wheeled vehicle having means forming a space whose temperature is to be regulated, a refrigerating unit for said space having an element adapted to be driven, a driving means for said element actuated by a wheel of said vehicle, a clutch member forming a driving connection between the driving means and the element to be driven, a piston operatively connected with the intake manifold of the vehicle motor by means including an electrically operated valve, said piston being connected to said clutch, and a thermostatic controlling member responsive to the temperature in said space for regulating the operation of the valve whereby to actuate the piston to withdraw the clutch from the driving means when the temperature in said space reaches a predetermined point.

2. In combination, a vehicle having supporting wheels movable toward and from the body of the vehicle and said vehicle having means forming a space whose temperature is to be regulated, supporting means carried by the vehicle beneath the said space and adjacent to one side of the body, a refrigerating system for the vehicle including a compressor, an electric motor secured upon the supporting means, said motor having a shaft arranged to operate the compressor, one end of said shaft projecting beyond the plane of the outer face of one of said supporting wheels, a pulley having a flange attached to the outer face of the hub of the wheel, a pulley on said motor shaft in substantially the same plane as that of the pulley on the wheel, a belt upon said pulleys of a length to permit the full range of movement of the supporting wheel toward and from the body, and means for maintaining substantially uniform tension upon said belt during said movement of the wheel and means for connecting the electric motor with a source of electrical energy independent of the vehicle.

3. In a refrigerating system for a wheeled vehicle, a refrigerating unit including a refrigerant compressor, an electric motor supported beneath the vehicle and having a shaft forming a drive for the compressor when connected with a source of current, a pulley on the shaft of said motor lying in a plane outside of the outer surface of one of the supporting wheels of the vehicle, a pulley shaft having at one end a flange secured to the hub of the supporting wheel and having at the other end a pulley thereon lying in substantially the same plane with the pulley on the motor shaft, and a belt connecting the two pulleys to drive the shaft when the motor is not connected with a source of current.

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