

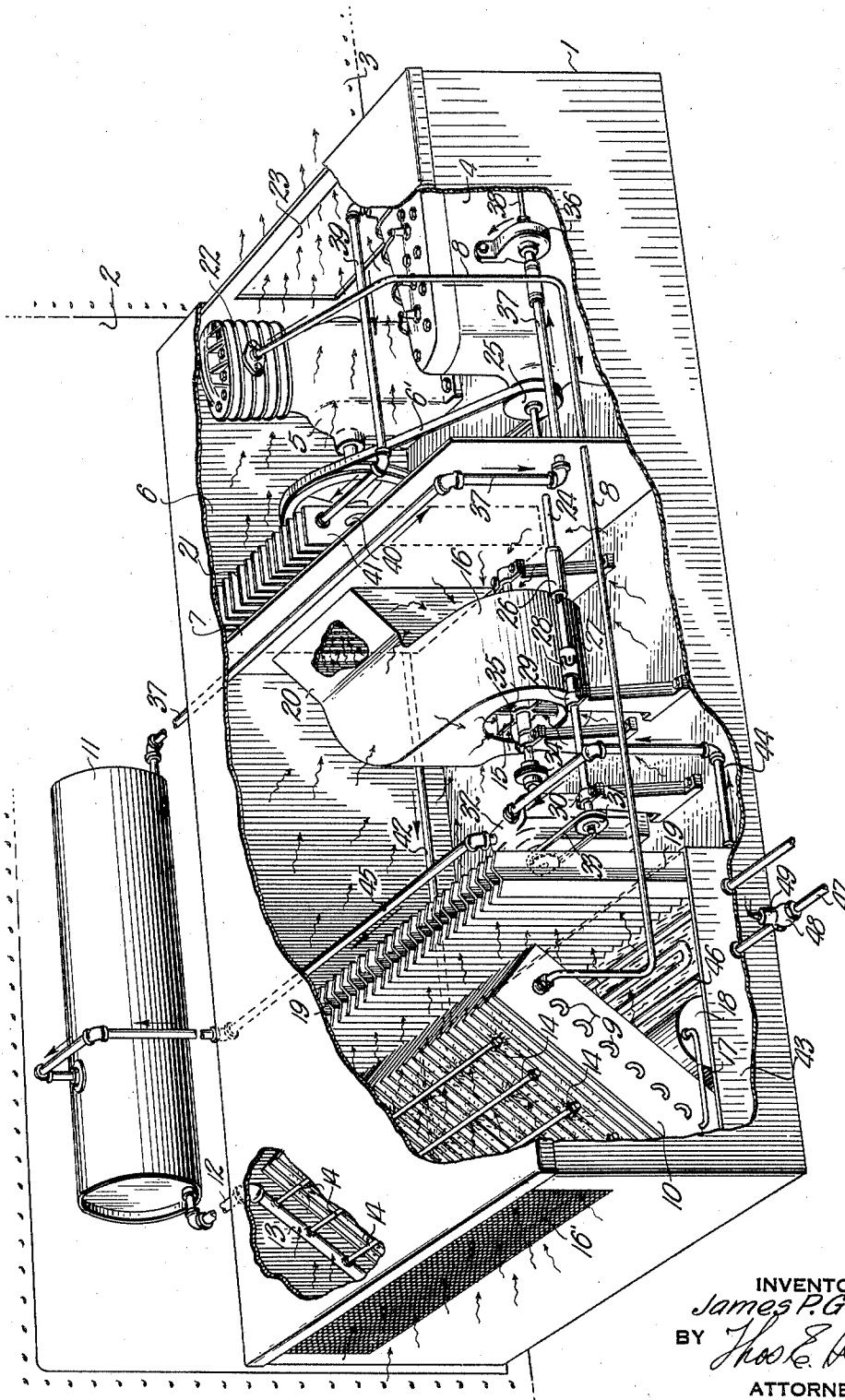
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AIR CONDITIONING ASSEMBLY FOR VEHICLES

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AIR CONDITIONING ASSEMBLY FOR
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My invention relates to an air conditioning assembly for vehicles, such as omnibuses, railway cars, and the like.

Bus transportation systems have grown so largely in recent years that there has been a tendency on the part of transportation companies to use larger buses. Most States have enacted State laws limiting the width and weight of motor vehicles which may travel over the highways of respective States. In view of the fact that most railways have had their passenger cars air conditioned, it has become an economic necessity from the standpoint of competition that bus systems air condition their vehicles during the summer months. The weight of the air conditioning system obviously is dead weight, which necessitates the carrying of a smaller "pay" load.

One object of my invention is to provide an air conditioning assembly for buses, railway cars and the like, which is light in weight and efficient in operation.

Another object of my invention is to provide an air conditioning assembly for buses in which the compressor of the refrigerating system is operated by an internal combustion engine and in which water from the evaporative condenser system is employed to cool the internal combustion engine.

Other and further objects of my invention will appear from the following description.

The accompanying drawing is a perspective view of one embodiment of my invention.

Referring now to the drawing, the assembly is housed in a casing 1, which is adapted to be removably positioned in a compartment 2, provided within the bus or vehicle body 3.

An internal combustion engine 4 is adapted to drive a refrigerant fluid compressor 5 through a belt 6, or in any other suitable manner. The internal combustion engine 4 and the compressor 5 are mounted in a compartment 6 separated from the remainder of the casing 1 by a partition 7. The refrigerant fluid from the refrigeration coil (not shown) is compressed in compressor 5 and discharged through pipe 8 to a condenser coil 9, which is provided with a plurality of fins 10. Water from tank 11, which may be situated at an elevated place, flows by gravity from the tank through pipe 12 to a manifold 13, from which it flows through spray pipes 14 for showering over the condenser coil 9 and the associated fins 10. A blower fan 15 is mounted within a blower casing 16, which is situated in the evaporative condenser compartment, and takes suc-

tion therefrom. The blower suction draws air through grille 16' for passage over the water being sprayed from spray pipes 14. The evaporative action of the air stream lowers the temperature of the water, which in turn cools the hot compressed refrigerant fluid. The cooled compressed refrigerant fluid leaves the condenser coil 9 through pipe 17 and passes into a receiver 18 from which it passes to the refrigerating coil (not shown), which is situated in the space to be conditioned. The air stream after passing over the water sprays and condenser passes through baffles 19 which serve to knock out any entrained moisture. The air stream then passes, as shown by the arrows, to the intake of blower fan 15, and is discharged through duct 20 through the partition 7 adjacent a finned heat exchanger 21, thence around the compressor head which is provided with air cooling fins 22, and out through discharge opening 23. The motor shaft 24 carries a driving pulley 25, which actuates the compressor through belt 6'. The motor shaft 24 is splined by coupling 26 to an extension shaft 27, provided with a universal joint 28 and operating in bearings 29 and 30. A drive pulley 31 is adapted to drive a water circulating pump 32 through driving belt 33. The pump shaft is coupled by coupling 34 to the blower shaft 35. A water circulating pump 36 is driven in any suitable manner from the internal combustion engine 4, as, for example, by driving shaft 38. The pump 36 takes suction from the tank 11 through pipe 37 and discharges into the internal combustion cooling jacket. The internal combustion engine cooling water leaves the cooling jacket through pipe 39 and passes through a heat exchanger coil 40, provided with fins 41 forming the heat exchanger 21. The hot engine cooling water is cooled by heat exchange with the air stream being discharged through duct 20. The cooled engine circulating water leaves the heat exchanger 21 through pipe 42 and is discharged into the sump 43 of the evaporative condenser proper. The water discharged through the spray pipes 14 falls into the sump 43 along with the engine cooling water. The pump 32 takes suction from the sump 43 through pipe 44 and pumps the sump water through pipe 45 into the reservoir tank 11.

It will be observed that I have accomplished the objects of my invention. By eliminating the radiator for the internal combustion engine and the water reservoir for said radiator, I am enabled to save considerable weight. The volume of air necessary to operate the evaporative con-

denser is more than sufficient to cool the engine circulating water and the engine compartment, including the compressor head. The amount of water circulated through the internal combustion cooling jacket forms only a minor part of the total water circulated through the spray nozzles. The arrangement is such that the engine jacket is kept at a temperature in the vicinity of 180 to 190°. This cooling water is cooled to a much lower temperature by the heat exchanger 21. The water discharged through pipe 42 into the sump 43 is, of course, at a considerably higher temperature than the remaining water in the sump, but the quantity of water from pipe 42 is but a small part of the stream of water flowing into the sump from the spray nozzles.

My arrangement is independent of the motion of the vehicle and will operate whether the bus is stationary or traveling.

It will be observed that the evaporative condenser air not only cools the engine circulating water by heat exchange, but also cools the engine compartment and compressor head.

The coil 46 located in the sump 43 is the heating coil. It is connected through pipe 47 to the heating system of the vehicle and is controlled through a valve 48 operated by a solenoid 49. In certain periods of the year, such as the early spring or late fall, days occur which are sufficiently warm to require cooling. At night it is frequently necessary to heat the vehicle, and in some instances the outside temperature at night may go below freezing. This is especially true in a bus traveling, say, from St. Louis to the west coast. During the day, in Missouri and Kansas, air conditioning would be required. In Colorado at night the temperature may be below freezing. If the water in the condenser sump is not maintained at above freezing, damage to the parts may occur. The coil 46, therefore, acts as a safety means to prevent freezing of the condenser water, it being understood that the solenoid valve 49 is set to operate when the outside temperature is 32° F. or lower.

It will be understood that certain features and sub-combinations are of utility and may be employed without reference to other features and sub-combinations. This is contemplated by and is within the scope of my claims. It is further obvious that various changes may be made in details within the scope of my claims without departing from the spirit of my invention. It is, therefore, to be understood that my invention is not to be limited to the specific details shown and described.

Having thus described my invention, I claim:

1. In combination with a vehicle an air conditioning assembly including a compressor, an internal combustion engine connected to drive said compressor, a condenser coil adapted to cool the hot compressed refrigerant fluid, a water reservoir, means for spraying water from said reservoir over said condenser, a sump for the

sprayed water, a blower fan adapted to pass an air stream over said condenser and the water being sprayed thereon, said internal combustion engine having a water cooling jacket, an internal combustion engine water circulation pump, means providing communication between said reservoir and said pump, means for providing communication between said pump and the engine cooling water jacket, means providing communication between the cooling water jacket of said internal combustion engine and said condenser water sump, a second pump, means providing communication between said condenser water sump and said second pump, and means for passing water from said second pump to said water reservoir.

2. The combination as in claim 1 in which said means providing communication between said internal combustion engine cooling water jacket and said condenser water sump includes a heat exchanger positioned in the path of the air stream being moved by said blower.

3. An air conditioning assembly including in combination a housing, a partition dividing said housing into two compartments, an internal combustion engine and a compressor positioned in one of said compartments, means for operatively connecting said internal combustion engine to said compressor, a condenser coil and a blower fan positioned in the other of said compartments, said partition being provided with an opening, a duct providing communication between said opening and said blower fan, whereby said blower fan is adapted to pass an air stream through both of said compartments, a water reservoir, means for spraying water from said reservoir over said refrigerant fluid condenser, a condenser water sump for collecting sprayed water, means for circulating water from said sump to said reservoir and back to said sump, said internal combustion engine being provided with a cooling water jacket, means for passing water from said reservoir through said cooling jacket and to said sump, said housing being provided with openings in respective compartments whereby an air stream may pass from the atmosphere through said compartments for discharge again to the atmosphere, said air stream having in its path the water sprayed over said condenser.

4. An air conditioning assembly as in claim 3 including in combination a heat exchanger positioned in the path of said air stream between the discharge of the circulating water from the internal combustion engine cooling jacket and the condenser cooling water sump.

5. An assembly as in claim 3 in which said condenser cooling water sump is provided with heating means, and a valve controlling the passage of a heating medium therethrough.

6. An assembly as in claim 3 in which means are provided for driving said circulating means and said blower fan from said internal combustion engine.

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