

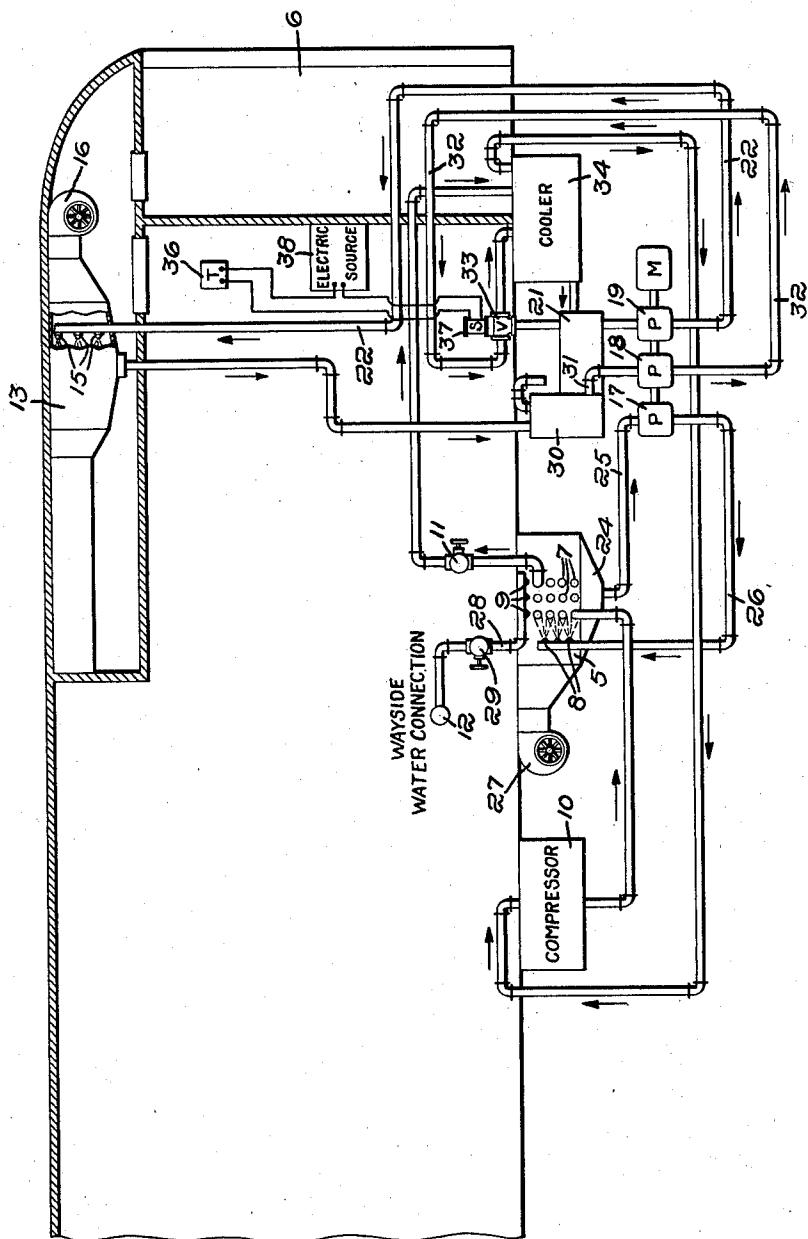
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REFRIGERATION APPARATUS FOR AIR CONDITIONED PASSENGER VEHICLES

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REFRIGERATION APPARATUS FOR AIR CONDITIONED PASSENGER VEHICLES

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This invention relates to refrigerating apparatus and relates more particularly to refrigerating apparatus including evaporative condensers for air conditioned passenger vehicles.

5 Evaporative condensers have been proposed for air conditioned passenger vehicles such as railway passenger cars, utilizing mechanical refrigeration, but have not been extensively used possibly because their relatively great first cost and increased maintenance cost were not justified by the saving in refrigeration. Prior evaporative condensers were units separate from the air conditioner and a great deal of apparatus was duplicated. The coils of such units due to their position under the cars collected a great deal of grime and were difficult to clean.

20 A feature of this invention resides in providing three pumps with rotors mounted on a single shaft and driven by a single motor, one pump providing water to an air washer for air conditioning, another circulating water through an evaporative condenser, and a third drawing water from an air relief chamber connected in the water return line of the air washer and supplying it to a 25 3-way valve for routing it to a sump for recirculation or alternatively to a chilled water source for recooling.

Another feature of this invention resides in providing wayside water connections with flooding nozzles above the condenser coils for cleaning the coils when the car is in the railroad yards.

An object of the invention is to reduce the energy required for air conditioned passenger vehicles.

35 Another object of the invention is to reduce the cost of condensing the refrigerant on air conditioned passenger vehicles.

Other objects of the invention will be apparent from the following description and from the 40 drawing.

The invention will now be described with reference to the drawing which illustrates diagrammatically one embodiment of the invention applied to a railway passenger car.

45 The evaporative condenser indicated generally by 5 is mounted on the under side of the car 6 and contains the condenser tubes 7, the evaporative spray nozzles 8 mounted alongside the tubes, and the flooding nozzles 9 mounted over the 50 tubes.

The compressor 10 supplies a volatile refrigerant to the tubes 7 where it is condensed and then through the expansion valve 11 and into the evaporator tubes in the cooler 34. After passing 55 through the cooler, the refrigerant is returned

through the pipe 14 to the suction side of the compressor 10.

The air conditioning unit contains the spray nozzles 15 for spraying water for cooling and washing the air. The blower 16 serves to supply 5 the air to be conditioned, to the unit 13.

The three pumps 17, 18, and 19 are mounted on the single shaft which is driven by the motor 20. The pump 19 draws water from the sump 21 and supplies it through the pipe 22 to the spray 10 nozzles 15 in the air conditioning unit 13.

The unevaporated water from the unit 13 passes through the pipe 23 to the air relief chamber 30 and is drawn from the chamber 30, through the pipe 31 by the pump 18 and then supplied 15 through the pipe 32 to the 3-way valve 33 from which it is returned to the sump 21 for recirculation to the air washer 13 or for recooling to the cooler 34.

The pump 17 draws water through the pipe 25 20 from the sump 24 of the condenser 5, and forces it through the pipe 26 to the spray nozzles 8.

The blower 27 forces air through the spray from the nozzles 8 and over the condenser coils 7. The spray water is cooled by evaporative cooling to the 25 wet bulb temperature of the air and the air and the spray cool the coils and the refrigerant to be condensed.

The flooding nozzles 9 are connected by the pipe 28 through the valve 29 to the wayside water 30 connection 12. The tubes 8 become coated with foreign matter during operation of the car and after a period of time, the connection 12 is attached in the railroad yards to a high pressure water supply and the valve 29 opened to permit 35 the tubes 8 to be thoroughly washed by the water sprayed downwardly upon them through the flooding nozzles 9.

The water draining from the unit 13 through the pipe 23 tends to entrap air which slows down 40 the draining action. The air and water enter the air relief chamber 30; the air separates above the water level and is vented out through the pipe 35, and the pump 18 draws the water from the chamber 30 and supplies it as previously described 45 to the 3-way valve 33.

The car thermostat acts when the desired low temperature is achieved to close an electric circuit including the solenoid 37 and the electric source 38 to cause the solenoid to adjust the valve 33 to route the water from the pipe 32 to the sump 21 for recirculation instead of to the cooler 34 for recooling.

Water to replace that evaporated in the con-

denser may be supplied from the sump 21, cooler 34 or from a make-up water tank.

While one embodiment of the invention has been described for the purpose of illustration, it should be understood that the invention is not limited to the exact apparatus and arrangement of apparatus illustrated since modifications thereof may be suggested by those skilled in the art without departure from the substance of the invention.

What is claimed is:

1. An air conditioning system for a passenger vehicle including an air washer, a refrigeration plant including an evaporative condenser and a sump containing water cooled by said plant, comprising means including a first pump for supplying water to the spray nozzles in said condenser, an air relief chamber below and connected to the

drain pipe of said washer, and means including a second pump for drawing the water from said chamber and for supplying it into said sump, said pumps being driven by a single means.

2. An air conditioning system for a passenger vehicle including an air washer, a refrigeration plant including an evaporative condenser and a sump containing water cooled by said plant, comprising means including a first pump for supplying water to the spray nozzles in said condenser, 10 means including a second pump for supplying water from said sump to the spray nozzles in said washer, an air relief chamber below and connected to the drain pipe of said washer, and means including a third pump for drawing water 15 from said chamber and for supplying it into said sump, said pumps being driven by a single means.

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