

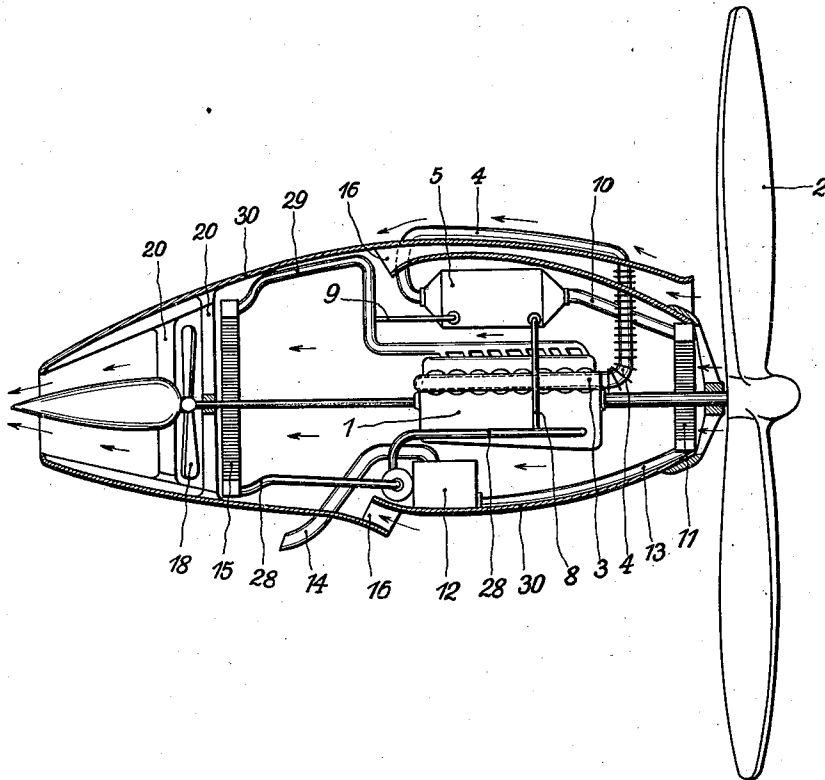
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WATER RECOVERY DEVICE FOR AIRSHIPS

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WATER RECOVERY DEVICE FOR AIRSHIPS

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My invention relates to airships, especially airships of the lighter than air type.

With such ships it is of advantage to provide means or devices by which ballast water may be gained while the ship is travelling through the air for the purpose of counteracting against the loss of weight caused by the fuel consumption in the motors. Many different devices for such purposes have been proposed, for example such for withdrawing water from the motor exhaust by means of calcium chloride and for driving out such water from the solution thus obtained. In the present case it is assumed that the motor exhaust is simply cooled down and that the water contained therein is condensed.

The main subject of my invention is to provide an apparatus for such purpose requiring a minimum of energy, weight and room for its proper working.

It has already been suggested to have cooling devices for the motor exhaust freely projecting from the outer cover of the airship. But by such an arrangement an enormous amount of energy is wasted which causes a considerable loss in speed of the airship.

According to my invention the cooling and condensing devices for water recovery from the motor exhaust are inclosed by the stream-line-shaped outer shell of the motor car or gondola which has its propeller arranged at its front end and is provided with openings for the air being pressed into the car and through the cooling devices. Experiments have proved that such arrangement is the most advantageous with regard to the want of energy for working the cooling devices and consequently the loss in speed of the airship is a minimum.

For the purpose of still increasing the economy according to my invention a ventilator or the like is provided inside of the shell of the motor car which increases the speed of the air flowing through the car to such extent that it has again the same speed as the outer air when it leaves the car at its stern end. Preferably such ventilator is driven directly from the ship's motor situated in front thereof.

I also prefer to arrange a plurality of steps for the cooling and condensation in such manner that the cooling device for the last step is situated next to the propeller, which means in the front portion of the car, so that the coolest air meets the water already cooled down. One of the cooling steps is indirect insofar as the cooling is accomplished by water and not directly by air, but the cooling water is in turn again cooled

down by a normal radiator through which the air passes. This radiator I prefer to place in the stern-most part of the motor car, and if practical it may be combined with the normal radiator for the engine to a common block or the like.

In certain cases it may be advisable to provide special slits or openings for leading additional fresh air to the cooling devices situated in the rear portion of the car. Also one or the other of the connecting tubes may be situated outside of the outer shell of the car, but then it must be closely fitting thereto and be running in the longitudinal direction.

In case there be three cooling steps provided the first step comprises cooling of the hot exhaust gases by air inside the car and possibly by connecting tubes running outside along the outer shell. The second step comprises a water cooled device through which the gases pass, the cooling water being cooled down again by an additional radiator in the stern of the car. And in the third step the water meanwhile having condensed from the exhaust gases is cooled down as near as possible to the temperature of the outer air by means of an air cooler in the bow of the car immediately behind the propeller driven by the motor and situated in front of the car.

The economy of the entire arrangement may be still increased by making use of the well-known counter stream principle wherever there is an opportunity therefor. Thus the weight of the entire device may be reduced and the space needed therefor also, which again means a reduction in size of the car and consequently an increase in speed of the ship. It may also help to the same end to provide ribs on the connecting tubes thereby increasing their cooling effect.

Having given a general description of my invention I now want to point out its features more in detail, having reference to the drawing which represents an example embodying my invention.

The figure is a merely diagrammatic longitudinal section through the stream-line shaped motor car of a lighter than air airship. The motor 1 is situated inside the car shell 30. Connected to the motor and in front of the car is the propeller 2. The air accelerated by the propeller flows in the directions indicated by the arrows. The motor exhaust gases pass from the exhaust 3 through tube 4 which is provided with cooling ribs and through the portion of tube 4 situated outside of the shell 30 to cooling device 5. In this device the exhaust gases are cooled by water which enters the device by means of

tube 8 and leaves it again through tube 9. These tubes are connected to the main water tubes 28 and 29 of the motor 1 and thus lead to the common radiator 15 situated in the stern of the car. The third and last cooling step is performed by radiator 11 connected to cooling device 5 by means of tube 10. Tube 13 leads the condensed and cooled water from radiator 11 to water container 12 from where it may be transported in any well-known manner to ballast containers in the airship (not represented). The exhaust gases which were not condensed escape by tube 14 into the outer air.

The are special air openings 16 allowing additional air to enter the car in front of radiator 15. A ventilator 18 sucks the air through this radiator and pushes it out of the car at its stern. Guiding members 20 of well-known kind serve for quieting the air current from disturbances thus making sure that the air having passed the car meets the outer air without eddies and possibly at equal speed.

I do not want to be limited to the details described or shown in the drawing, as many variations will occur to those skilled in the art.

What I claim is:

1. In a stream-line shaped motor car for airships in combination, an outer shell, a motor therein, a propeller in front of said shell driven by said motor, devices for cooling down the exhaust gases of said motor and for condensing the water vapor contained therein by means of cooling air, said devices being situated inside of said outer shell, said shell having at least one opening in its bow for the entrance of the air accelerated by said propeller and having a nozzle-like opening at its stern for the air to escape, and air-propelling means situated in the stern portion of said shell to accelerate the air passing through said shell, said air-propelling means and said motor being in driving connection.

2. In a stream-line shaped motor car for airships in combination an outer shell, a motor therein, a propeller in front of said shell driven by said motor, devices for cooling down the exhaust gases of said motor and for condensing the water vapor contained therein by means of cooling air, said devices being situated inside of said outer shell, said shell having at least one opening in its bow for the entrance of the air accelerated by said propeller and having a nozzle-like opening at its stern for the air to escape, said cooling devices including a radiator situated in the bow of said shell through which the exhaust gases are directed so that the cooling air is pressed directly through said radiator by said propeller.

3. In a stream-line shaped motor car for airships in combination an outer shell, a motor therein, a propeller in front of said shell driven by said motor, devices for cooling down the exhaust gases of said motor and for condensing the water vapor contained therein by means of cooling air, said devices being situated inside of said outer shell, said shell having at least one opening in its bow for the entrance of the air accelerated by said propeller and having a nozzle-like opening at its stern for the air to escape, said cooling devices comprising a water cooling system including an air-cooled radiator situated in the stern portion of said shell to re-cool the water of the cooling system.

4. In a stream-line shaped motor car for airships in combination an outer shell, a motor therein, a propeller in front of said shell driven

by said motor, devices for cooling down the exhaust gases of said motor and for condensing the water vapor contained therein by means of cooling air, said devices being situated inside of said outer shell, said shell having at least one opening in its bow for the entrance of the air accelerated by said propeller and having a nozzle-like opening at its stern for the air to escape, and at least one additional air inlet situated in the middle portion of said outer shell.

5. In an airship, the combination with a motor, of a water-cooling system for said motor, and a cooling system for cooling the exhaust gases of said motor comprising a portion at least of said water-cooling system for said motor, and additional means comprising a cooling radiator through which the exhaust gases are directed.

6. In an airship, the combination with a motor of a nacelle within which the motor is mounted, an exhaust conduit for conducting the exhaust gases away from the motor and a cooling radiator in the nacelle connected to said conduit so that the exhaust from the motor passes therethrough, a portion of said conduit being arranged externally of said nacelle between said motor and radiator and lying closely adjacent said nacelle longitudinally thereof.

7. In an airship, the combination with a motor, of a nacelle within which the motor is mounted, an exhaust conduit for conducting the exhaust gases away from the motor, and a cooling radiator in the forward portion of the nacelle connected to said conduit so that the exhaust from the motor passes therethrough, a portion of said conduit being arranged externally of said nacelle between said motor and radiator and lying closely adjacent said nacelle longitudinally thereof.

8. In an airship, the combination with a motor, of a nacelle within which the motor is mounted, an exhaust conduit for conducting the exhaust gases away from the motor, a cooling radiator in the nacelle connected to said conduit so that the exhaust from the motor passes therethrough, and a water-cooling system for said motor including means for directing cooling water around said conduit between said motor and said radiator.

9. In an airship the combination with a hollow motor housing substantially streamlined externally and, a motor within said housing, a water-cooling system for said motor comprising a radiator within said housing and rearwardly of said motor, conduits connecting said water-cooling radiator with said motor, an exhaust gas cooling radiator arranged forwardly of said motor, a conduit for conveying exhaust gases from said motor through said second radiator, and means for collecting condensation from said second radiator said housing directing the air entering same successively into engagement with the radiator in front of the motor, the motor and the radiator to the rear of said motor, whereby the cooler air cools the exhaust gases from the engine before it is warmed by said motor.

10. A device as set forth in claim 9, in which said water-cooling system includes means for directing at least a portion of the water for cooling said motor into heat-exchanging relationship with the exhaust gases from said motor to pre-cool the said gases before they pass through said second-mentioned radiator.

11. A device as set forth in claim 9 including an air propeller forwardly of said housing for propelling the airship and for directing air through said housing.

12. A device as set forth in claim 9 including

an air propeller forwardly of said housing for propelling the airship and for directing air through said housing, and a second air propeller within and to the rear of said housing for accelerating the passage of air through said housing.

13. In an airship the combination with a nacelle for housing a motor, a motor within said nacelle, a propeller at the forward end of said motor outside of said nacelle for forcing air through said nacelle, an exhaust conduit leading from said motor, and an air-cooled condenser arranged between said motor and propeller and connected to said conduit for cooling the exhaust gases by the air circulated by the propeller before the air reaches said engine.

14. A device as set forth in claim 13 including a water-cooling system for the motor comprising a radiator located to the rear of said motor, said water-cooling system being so constructed and arranged that a portion of the cooling water

is circulated about said conduit to remove some of the heat from said exhaust gases before the same reach the air-cooled condenser.

15. In a stream-line shaped motor car for airships in combination an outer shell, a motor therein, a propeller in front of said shell driven by said motor, devices for cooling down the exhaust gases of said motor and for condensing the water vapor contained therein by means of cooling air, said devices being situated inside of said outer shell, said shell having at least one opening in its bow for the entrance of the air accelerated by said propeller and having a nozzle-like opening at its stern for the air to escape, and said devices being arranged in the path of air accelerated by said propeller, and air-propelling means situated within the stern portion of said shell to accelerate the air passing through said shell.

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