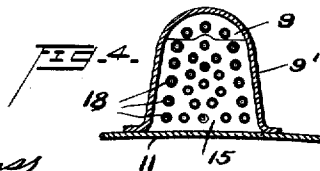
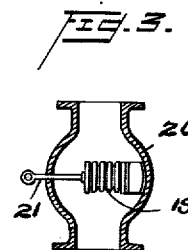
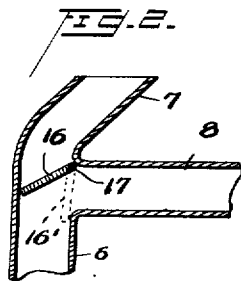
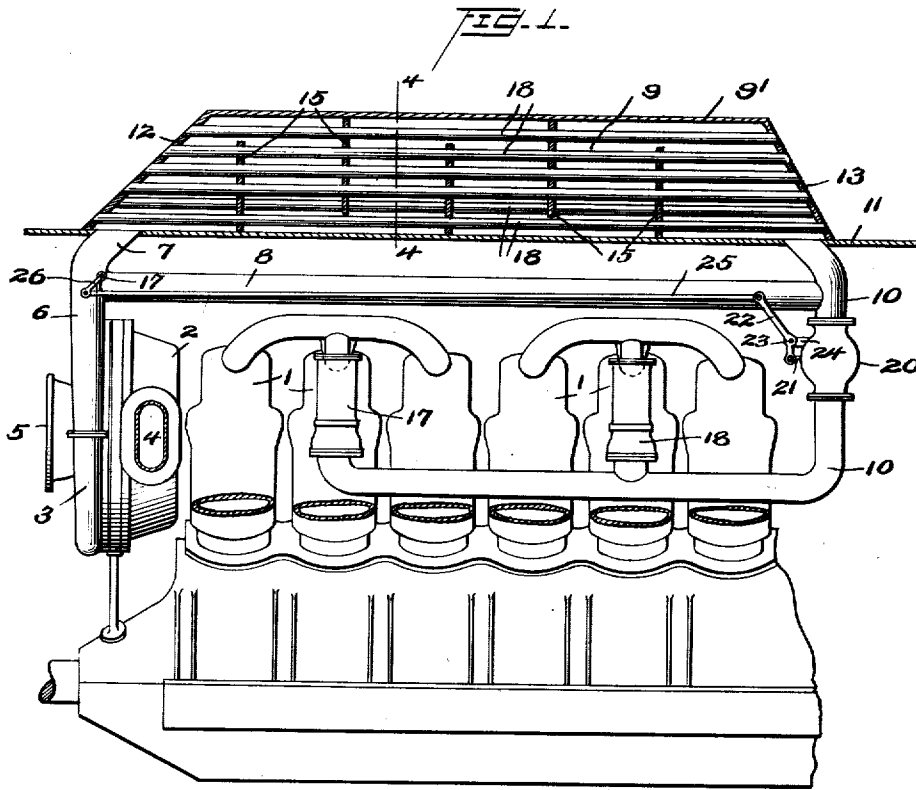


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 CONTROL FOR AIR DELIVERY COOLER FOR TURBO COMPRESSORS.
 APPLICATION FILED MAY 14, 1918. RENEWED JAN. 26, 1921.

1,371,444.

Patented Mar. 15, 1921.



WITNESS

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EARL H. SHERBONDY, OF CLEVELAND, OHIO.

CONTROL FOR AIR-DELIVERY COOLER FOR TURBO-COMPRESSORS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EARL H. SHERBONDY, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Controls for Air-Delivery Coolers for Turbo-Compressors, (Case TT,) of which the following is a specification.

This invention relates to an apparatus for automatically cooling more or less of the air that has been compressed by a turbo-compressor. The turbo-compressor in question is adapted to be operated by the waste gases from an airplane engine, and is intended to supply air under pressure to the carbureters of said engine, in order to compensate for the loss in power ordinarily met with at high altitudes, due to the thin air and consequent low oxygen content of the air at such altitudes.

The air compressed by the compressor becomes quite hot for a number of reasons—First. Compressing air with a perfect compressor will, as is well known, raise its temperature. Second. The inevitable frictional losses which take place in an air compressor also heat up the air. Third. The air casing for the compressor, in view of the limitations of space in an airplane fuselage, must be positioned rather close to the turbine casing, which, in view of the fact that it is operated by the hot exhaust gases, is itself at a rather high temperature. This results in more or less radiation of heat to the compressor casing, and further heating of the air.

In my co-pending case, Serial #231768, filed April 30, 1918, I have shown means for cooling this air which, due to the just mentioned features which cause heating thereof, is too hot for use in the carbureter.

It is an object of this invention to provide automatic means for cooling a portion of the air so heated, or all of it, so that its temperature is maintained substantially constant.

It is a further object of the invention to provide a branched delivery pipe from the air compressor, and to have one of said branches lead to a cooling device for the air, and to provide means for directing more or less of the air through the cooling device to maintain the temperature of the final air within a suitable range.

Other objects and advantages will appear as the description proceeds.

In the drawings, Figure 1 shows the device in place on an airplane engine; Fig. 2 is a view on an enlarged scale of the branched delivery pipe and controlling valve therefor; Fig. 3 is a view of the thermostat that controls said valve; and Fig. 4 is a section on line 4—4 of Fig. 1.

The turbo-compressor is mounted in front of the cylinders 1 of the airplane engine, and comprises a turbine casing 2 and a compressor casing 3. A turbine wheel (not shown) is mounted in the casing 2, and is intended to be operated by the exhaust gases from the engine, which are led into the casing through the opening 4, and may escape therefrom through a suitable opening on the other side (not shown). A centrifugal blower wheel is positioned within the casing 3, the air for said wheel entering through the flaring mouth 5. The air compressed by the compressor wheel passes into the delivery pipe 6. The detailed structure of the turbo-compressor unit just described forms no part of the invention, and is not further described here. For further details, attention is called to my co-pending case, Serial #224,357, filed March 23, 1918.

The air delivery pipe 6 is provided with the branches 7 and 8, the branch 7 opening into a cooler 9, and the branch 8 opening into the final air pipe 10.

As set forth in my co-pending case Serial No. 231,768, filed April 30, 1918, a cooler 9, which may be made in a number of different forms, is here shown as comprising a casing 9', mounted on the top 11 of the airplane fuselage. This casing 9' is provided with perforated end plates 12 and 13. Mounted in these perforations are a series of open-ended tubes 18, facing respectively, forwardly and backwardly in the direction of travel of the airplane, so that as the airplane travels through the air the cool atmospheric air will travel through these pipes and keep them relatively cool. The hot air from the branch 7 passes around the outside surfaces of these cooling pipes on its way to the final air pipe 10, and so will give up some of its heat during its transit through the cooler 9. Baffle plates 15 may be provided to cause a proper circulation of the air through the cooler. A valve 16 is positioned at the junction of the branches

7 and 8, and is so positioned that it will distribute more or less air to the branches 7 and 8, respectively, according to the position in which it may be. As shown in Fig. 2, the valve 16 is pivoted at 17, and is there positioned to send all of the compressed air through the branch 8 to the final air pipe 10 without cooling any of it. It is evident that when the valve 16 is in the position shown at 16', all of the air will be sent through the cooler. And it is further evident that in the position intermediate these two positions just described, the air will be distributed to the branch pipes 7 and 8 to cool more or less of it.

The air that is passed through the cooler is delivered to the final air pipe 10, from whence it passes to the carbureters 17 and 18 for the engine.

The automatic control for the valve 16 will now be described. A suitable temperature responsive element, such as the thermostat 19, may be positioned in a casing 20, interpolated in the air pipe 10. This is shown here diagrammatically, and may be of any of a number of possible forms. The thermostat controls a rod 21, which in turn is connected to a bell crank 22, pivoted at 23 and on 24, mounted on the casing 20. The other arm of the bell crank controls rod 25, which is connected to an arm 26 that controls a pivot 17 of the valve 16. The operation of the valve will be obvious. If the air in the final pipe becomes too hot, the thermostat expands and causes the rod 25 to be pulled to the right and so moves the valve 16 all or part way to the position 16' to distribute part of the air to the branch pipe 7 for the cooler. On the other hand,

should the air compressed in the pipe 6 not be overheated at all, the thermostat would be relatively cool and would hold the valve 16 in the position shown in Fig. 2, so that none of the air goes through the cooler.

While I have shown possible embodiments of my invention, it should be understood that it may be carried out in other ways, as defined within the scope of the appended claims.

I claim:—

1. In combination with an airplane fuselage, an engine, a turbo-compressor, adapted to be operated by the exhaust gases from the engine, and a cooler for the air compressed by said turbo-compressor, positioned on the outside of said fuselage.

2. The combination as claimed in claim 1, in combination with a branch pipe inside the fuselage and thermally operated means to distribute the compressed air between the cooler and said branch pipe.

3. The combination as in claim 1, and a by-pass around said cooler.

4. The combination as in claim 3, said by-pass positioned within the fuselage.

5. The combination as in claim 3, and means controlling the passage of air through said by-pass.

6. The combination as in claim 4, and a valve controlling said by-pass.

7. The combination as in claim 6, and means controlling said valve.

8. The combination as in claim 2, said thermally operated means governed by the temperature of the air as it leaves the cooler.

In testimony whereof I affix my signature.

EARL H. SHERBONDY.