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PORTABLE SOUND SUPPRESSORS FOR AIRCRAFT JET ENGINES

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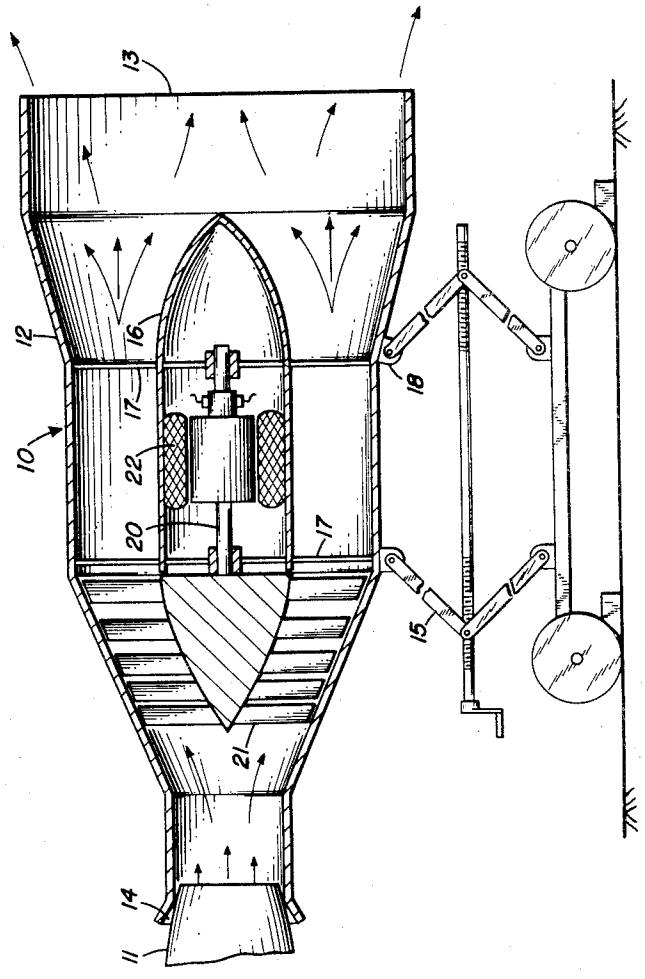

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PORTABLE SOUND SUPPRESSORS FOR AIRCRAFT JET ENGINES

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5 Claims. (Cl. 181—36)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to a method of and apparatus for reducing the noise and heat of the exhaust from jet engines while being operated on the ground and more particularly to a method and apparatus for reducing the noise and heat of the exhaust from jet engines without the use of large sound chambers, water and the like.

It has been the practice to suppress the noise and heat of jet engine exhaust by the use of towers, water-spray tunnels and baffles. These devices are of such great size and bulk that their transportation from place to place is prohibitive. They are also restricted in their use with engines which are installed in aircraft and in portable test beds. Morever, the large size of the above devices make them impractical as a part of a squadron's equipment.

Furthermore, the gas discharged from jet propulsion motors is usually at an extremely high temperature and conventional silencing means are likely to deteriorate rapidly under such conditions.

An object of the present invention is the provision of a method and apparatus for suppressing the noise and heat of the exhaust from jet engines while said engines are being operated on the ground.

Another object of the invention is the cooling of the discharge gases so that they will not destroy the means provided for silencing them.

Still another object of the invention is to employ the heat and pressure of the exhaust gases for creating electrical energy.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing wherein:

The single figure shows a cross-sectional view of a sound suppressor attached to the exhaust end of a jet engine.

Referring now to the drawing, there is shown a sound suppressor generally indicated as **10** attached to the exhaust end of a jet engine **11**. The jet engine sound suppressor is comprised of a cylindrical housing of increasing diameter formed by an outer shell **12** having an exhaust opening **13** and an intake opening **14**. By the use of a suitable support mechanism, such as the portable jack **15** attached to the housing by brackets **18**, the suppressor can be raised and placed around the exhaust of the jet engine **11**. Within the housing of the suppressor **10** is a turbine **16** centrally mounted by means of brackets **17**. A shaft **20** leads to the turbine blades **21** with the blade end of the turbine being closer to the intake opening **14**. An electric generator **22** is located within the turbine **16** to absorb the energy produced.

The sound suppressor described above operates in the following manner. The hot exhaust gases of the jet

engine are directed through the intake opening **14** of the suppressor **10**. At this stage, the gases are hot, under high pressure and full of sound waves. As the gases proceed between the blades **21** of the turbine, the gases expand because of the increasing distance between said blades. Due to this expansion, the high pressure of the gases is reduced. The passage of the gases through the blades **21** rotates said blades and thus operates the turbine. The energy expended in doing so absorbs a large amount of the heat in the gases. Because of the increased volume of gases discharging from the turbine, the sound waves contained therein have expanded over a larger area and thereby the pitch of the sound is reduced. Furthermore, the high frequency sound waves beating on the turbine blades as they enter the turbine will tend to be dampened by the low frequency sound waves beating against the same blades on the exhaust side. By this operation, the temperature and pressure of the exhaust gases have been reduced and the frequency of the sound waves has been sharply diminished. Moreover, since the turbine blades are thus rotating at a high rate of speed, the turbine shaft **20** and generator **22** are then employed to drive equipment and thereby absorb the developed energy. After passing through the turbine blades, the gases pass through the casing to exhaust opening **13** and into the atmosphere as indicated by arrows on the drawing.

Thus, the noise and heat created by the exhaust gases of jet engines are greatly reduced by the cooling and expansion of the gases through the use of a turbine in a suitable housing. Lower temperatures, velocity and pressure and incompatible sound waves are produced by the use of the above described suppressor, thereby prohibiting the resonance of the surrounding structure and resulting in the reduction in the intensity of the sound emitted. At the same time, the energy of the gases is absorbed to operate electrical equipment.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. Apparatus for reducing the heat and noise created by the exhaust gases of jet engines, said apparatus comprising an outer shell having an inlet and outlet opening, a portable jack fixedly secured to said shell, said shell having a first, second and third section intermediate said inlet and outlet openings, said first section being downstream of and connected to said inlet opening and being provided with a first gas expansion means, said second section being downstream of and connected to said first section and being provided with a temperature absorbing means, said third section being downstream of and connected to said second section and being provided with a second gas expansion means, said outlet being connected to the downstream end of said third section, whereby said first, second and third sections cooperate to reduce the heat and noise created by the exhaust gases.

2. An apparatus as described in claim 1 wherein said first gas expansion means is formed by a first conical section of said shell, with a turbine centrally mounted therein, said turbine having a shaft with a plurality of rows of blades mounted thereon for rotation therewith, said rows of blades being of increasing diameter and the spacing between adjacent rows of blades increasing in a downstream direction thereby permitting an expansion and pressure reduction of said gases.

3. An apparatus as described in claim 2 wherein said temperature absorbing means is formed by a generator operatively connected to said rotating shaft whereby the energy expended in rotating said shaft absorbs a con-

siderable amount of the heat energy in said gases resulting in a temperature drop of said gases.

4. An apparatus as described in claim 3 wherein said second gas expansion means is formed by a second conical section of said shell increasing in diameter in a downstream direction whereby the gases are permitted to further expand and reduce the pressure thereof.

5. Apparatus for reducing the temperature and noise created by the exhaust gases of jet engines, said apparatus comprising an outer shell having an intake and exhaust opening with a first, second and third section therebetween, said first section having a conical portion increasing in diameter in a downstream direction and being connected to said second section which is of uniform diameter throughout its entire length, said third section being connected to the downstream end of said second section and also increasing in diameter in a downstream direction, said shell forming a cylindrical pipe at its smallest diameter for insertion over the exhaust pipe of an engine, a plurality of brackets mounted on the base of said second section of said shell, a portable jack connected to said brackets for manipulation of said shell, a turbine and shaft mounted centrally within said shell,

said turbine having a series of blades rotatably mounted within said first section and operatively connected to said shaft imparting rotation thereto with the passing of gases therethrough, said blades being spaced at increasing distances from each other in a downstream direction, a generator mounted in said second section at the downstream end of said shaft and rotated thereby, said third section terminating in an annular opening which provides an outlet for said gases to the atmosphere.

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