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BAFFLE TYPE MUFFLER WITH SOUND ABSORBING MATERIAL

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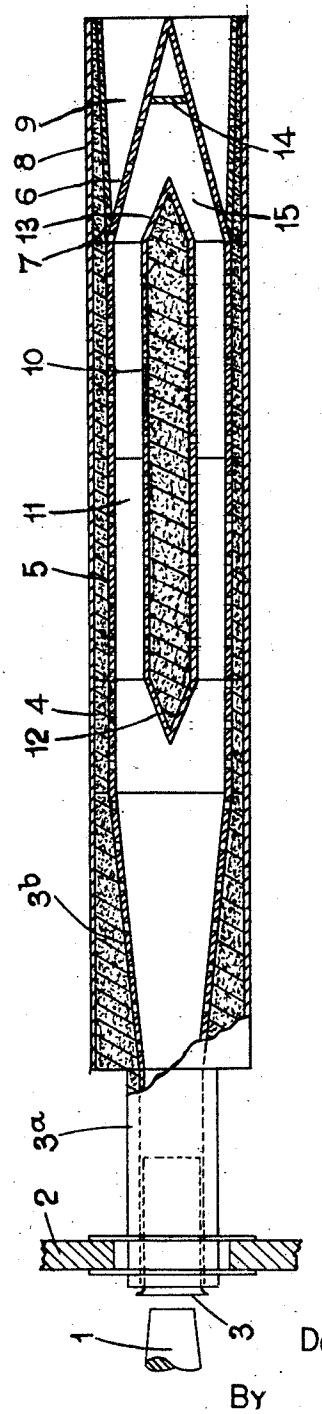

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BAFFLE TYPE MUFFLER WITH SOUND ABSORBING MATERIAL

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1 Claim. (Cl. 181—50)

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In the construction and testing of jet propulsion engines, such as in research and test workshops, the engines are suitably supported on their benches or equivalent with their jet nozzles directed towards an aperture or respective apertures in the wall of the workshop in order that the flames and products of combustion of the jets shall be discharged into the outside atmosphere. A great noise is caused by the jets during test, and it is known to employ a so-called "detuner" arranged outside the building with its mouth located in or passing through the wall aperture to receive the issuing jet and partially absorb and minimise the sound. The aperture is sometimes provided with a pair of doors which are opened to allow the detuner to be run up so as to dispose its mouth in proximity to the engine during use. These detuners are usually in the form of a perforated cylindrical tube concentrically mounted within another tube to form an annular space which is lagged with sound-absorbing material.

The present invention is an improvement in noise-suppressing apparatus for the foregoing purpose, and has for its objects to provide optimum operating conditions for the engine while suppressing the noise, and to absorb the sound of the issuing jet to a greater degree than is attained by known detuners.

According to the present invention there is provided noise suppressing apparatus for use in testing jet engines comprising a detuner tube having an interior hollow pocket-like baffle, projecting so as to be in the path of the gas stream and having its mouth directed towards the entrance to the tube. In practical embodiments of the invention the said baffle is a hollow perforated or equivalent structure of metal or other suitable material supported substantially concentrically within the detuner tube and arranged so that there is an annular space between its wall and the inner wall of the tube at all points between the mouth and rear end of the baffle. Preferably a part or the whole of the baffle, in longitudinal section, is progressively smaller towards its rear end. To form a complete obstruction across the detuner tube the edge of the mouth of the baffle, such as a flange, is fixed in contact with the inner wall of the detuner so that its body is spaced from the inner wall of the detuner tube. A part or the whole of the detuner and, where an inner sound absorbing core is used, as hereinafter described, at least the section of the detuner tube which embraces this core, is constructed with an outer jacket which is lagged interiorly, e. g. by rock

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wool, to provide sound absorption, and the lagging is protected by a perforated metal liner tube.

In the use of the improved device the flames and combustion products from the jet exhaust are directed into the interior of this pocket-like baffle and escape through the perforations into the space between the baffle and the surrounding detuner wall. The baffle may be of conical, pyramidal or semi-spherical form, or may be cylindrical of smaller diameter than the inner wall of the jacket and with an out-turned flange at the mouth for attachment to the jacket, or it may be any suitable combination of these shapes, e. g. cylindrical with a spherical or conical end. Instead of a single pocket it may be an assembly of pockets in laminated array, slightly spaced to give passage for the gases, either with or without sound absorbing material interposed between the plates.

One baffle is preferably disposed at or near the exit end of the detuner, and may be associated with a core supported within the detuner to lie longitudinally along the centre thereof, said core preferably having pointed deflector ends, one of which terminates within the said baffle. Said inner core is a hollow member containing a suitable sound-absorbing packing and the wall of the body thereof is perforated. The flames and combustion products transverse the space between the core and wall of the detuner, eventually entering the baffle and passing along the space between the end of the core and the wall of the baffle.

The accompanying drawing illustrates diagrammatically an embodiment including the various features of the invention.

In this drawing 1 is the jet engine exhaust which is located opposite an aperture in a wall 2, through which aperture is projected the leading end 3 of the detuner tube while this leading end may take any suitable form. It may be telescopically mounted in a main part 3*a* which leads to an entrance 3*b* of frusto-conical interior. The detuner part 3*b* extends into a second tubular part 4 which consists of a jacket having an interior sound absorbing lining which is protected by a perforated liner 5. Near the rear or exit end of the detuner part 4 the interior passage is obstructed by conical baffle plate 6 which is perforated and which has a mouth flange secured to an annular shoulder 7 formed on the inner wall of the detuner part 4. The baffle mouth is co-extensive with the perforated liner 5, with the apex of the cone directed towards the rear. The baffle, in conjunction with the rear internal wall

8 of the detuner, forms a diverging annular passageway 9 through which the gases pass to atmosphere.

Increased sound absorption is provided by the core 10 which is a hollow perforated metal cylinder of circular cross section coaxial with the detuner part 4 and filled with rock wool or other suitable sound absorbing material. The core is of smaller diameter than the inner wall of the detuner tube so as to provide an annular gas channel 11 leading to the baffle 6, the ends 12, 13 of the core being conical deflectors which guide the gases in the required direction, for which purpose they are advantageously plain and not perforated, the rear end 13 being located within the baffle 6 as shown. The pointed end of the baffle 6 may be blanked off by a plate 14 which may or may not be perforated. The tip of the cone in rear of the plate 14 may be imperforate.

Although any suitable cross section may be given to the detuner 4, the core 10 and the baffle 6, it is advantageous to adopt a circular section for all three, giving the core a torpedo shape with conical ends as shown, and the baffle a conical shape, but the angle of the cone of the baffle need not necessarily correspond with the angle of the point of the core end 13; in fact as shown it is preferable that the angle of the baffle is more acute than the angle of the core point whereby the annular space 15 between core and baffle gradually increases in cross section towards the outlet.

For utmost efficiency, the area of the annular space 9 outside the baffle and between the baffle and detuner wall taken at any plane normal to the axis of the detuner should be not less than (and preferably is greater than) the superficial area in the aggregate of all the perforations in the baffle between said plane and the base of the baffle, this area relationship being particularly applicable when a conical baffle is employed as shown.

I claim:

Noise suppressing apparatus for use in testing jet engines, comprising a cylindrical muffler tube, an interior lining of sound absorbing material for said tube, a protective perforated liner for said material, said tube with its sound absorbing lining and perforated liner comprising a gas entrance portion of frusto-conical section providing greater thickness of sound absorbing material at the entrance end of said portion than at the remote end of said portion, an intermediate portion wherein the annular space for the sound absorbing material between the tube and the liner is of uniform cross-section along the entire length of the intermediate portion, and a gas discharge portion wherein the liner flares outwardly towards the outer end of the tube providing a diminishing thickness of sound absorbing material between the tube and the liner, a hollow conical perforated baffle located within said gas discharge portion with the mouth of the baffle directed towards the entrance portion of the tube and co-extensive with the outer end of the intermediate portion of the tube, an imperforate conical cap attached to the rear end of the frusto-conical baffle, an imperforate plate closing the outer end of said baffle, a perforated hollow core supported co-axially within the intermediate portion of the tube and extending from inside the entrance end of the intermediate portion to inside the mouth of said baffle and forming with the intermediate portion an annular gas channel leading to the mouth of the baffle, imperforate conical deflectors closing the ends of the core, and a filling of sound absorbing material within the core.

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