GAS TURBINE ENGINE SYSTEMS INVOLVING VARIABLE NOZZLES WITH SLIDING DOORS

BACKGROUND

1. Technical Field

The disclosure generally relates to gas turbine engines.

2. Description of the Related Art

Variable cycle engines power high performance aircraft over a range of operating conditions yet achieve countervailing objectives such as high specific thrust and low fuel consumption. A variable cycle engine essential alters the engine bypass ratio during flight to facilitate efficient performance over a broad range of altitude and flight velocity such as to generate high thrust for maneuver and optimized fuel efficiency for loiter.

Variable cycle engines typically include a variable exhaust nozzle system which operates over a wide range of pressure ratios by adjustment of a nozzle throat based on the demands of the engine cycle, and may include provision for adjustment of a nozzle area ratio to facilitate desired engine performance at various operating points.

The variable cycle engine and exhaust described herein comprises of three flow streams, exhausting through two nozzles. The low pressure compressor stream and core stream exhaust through the primary nozzle. The fan stream exits the variable secondary nozzle. Varying the secondary nozzle alters thrust at the nozzle exit. Also varying the secondary nozzle exit area affects the overall engine cycle by directing of flow into or diverting away from the primary flowpath by varying third stream back pressure, thus effectively altering the bypass ratio.

SUMMARY

A nozzle assembly for a gas turbine engine according to an exemplary aspect of the present disclosure includes a door adjacent a secondary flow path for a secondary flow and a primary flow path for a primary flow, the door axially slidable relative to a passage in communication with the secondary flow path to regulate the secondary flow though said passage.

A gas turbine engine according to an exemplary aspect of the present disclosure includes an engine duct structure and an inner structure which at least partially define a secondary flow path for a secondary flow and a primary flow path for a primary flow, the secondary flow path defined at least partially around a perimeter of the primary flow path. A secondary flow duct with a generally planar secondary nozzle to communicate the secondary flow therethrough and a primary flow duct with a generally planar primary nozzle to communicate the primary flow therethrough, the generally planar primary nozzle adjacent to the generally planar secondary nozzle. A door axially slidable relative to a passage in communication with the secondary flow path to regulate the secondary flow though said passage.

Other systems, methods, features and/or advantages of this disclosure will be or may become apparent to one with skill in the art upon examination of the following drawings and detailed description. It is intended that all such additional systems, methods, features and/or advantages be included within this description and be within the scope of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

Many aspects of the disclosure can be better understood with reference to the following drawings. The components in

the drawings are not necessarily to scale. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

FIG. **1** is a schematic diagram depicting an exemplary embodiment of a gas turbine engine.

FIG. **2** is a cross-sectional perspective diagram of the gas turbine engine of FIG. **1**.

FIG. **3** is a perspective diagram depicting an exemplary embodiment of a nozzle assembly.

FIG. **4** is a schematic diagram depicting the sliding door of the embodiment of FIG. **3** in a planar view.

DETAILED DESCRIPTION

Gas turbine engine systems involving variable nozzles with sliding doors are provided, several exemplary embodiments of which will be described in detail. In some embodiments, such a sliding door is moved fore and aft in a gas turbine engine to vary the nozzle exhaust area of the engine dynamically. Varying the nozzle exhaust area in a gas turbine engine can increase engine performance characteristics such as fuel efficiency.

FIG. **1** is a schematic diagram depicting an exemplary embodiment of a gas turbine engine **100** in which a nozzle assembly **10** that incorporates a sliding door can be used to operatively vary the nozzle assembly **10** and affect engine performance.

As shown in both FIG. **1** and FIG. **2**, the gas turbine engine **100** includes a fan section **101**, a compressor section **102**, a combustion section **104**, a turbine section **106**, and an exhaust section **108**. The compressor section **102**, combustion section **104** and turbine section **106** are generally referred to as the core engine. A central longitudinal axis of the engine A extends longitudinally through these sections. It should be noted that although engine **100** is a turbofan engine, there is no intention to limit the concepts to use with turbofan engines as other types of gas turbine engines can be used.

A secondary duct **110** and a primary duct **112** respectively define an at least partially annular secondary flow path **114** at least partially around a perimeter of a primary flow path **118** which directs a primary combustion core gas exhaust flow (illustrated schematically by arrow E). The secondary duct **110** in one non-limiting embodiment is a bifurcated duct arrangement which join at the generally planar secondary nozzle **12** (FIG. **2**). The primary duct **112** is generally circular in cross-section at an upstream segment and transitions into the generally planar primary nozzle **14** at an aft end thereof. The secondary nozzle **12** and the primary nozzle **14** in the disclosed non-limiting embodiment include a straight shaped trailing edge, however, it should be understood that any other configuration may alternatively be utilized. It should be understood that the engine duct structure **110**, **112** may also at least partially define various flow paths other than the disclosed secondary flow path **114**.

Engine **100** includes a nozzle assembly **10**, located at the aft end of the exhaust section **108**, that defines the generally planar secondary nozzle **12** and the generally planar primary nozzle **14** adjacent thereto. The secondary flow path **114** guides a secondary flow S typically sourced from the fan section **101** and/or the compressor section **102**. The secondary flow S is utilized for a multiple of purposes including, for example, cooling, pressurization, and mixing with the primary combustion core gas exhaust flow E prior to discharge through the nozzle assembly **10** during particular operational profiles.

The secondary flow S as defined herein is any flow different from the primary combustion core gas exhaust flow E such as