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(71) Applicant: **General Electric Company**
Schenectady, NY 12345 (US)

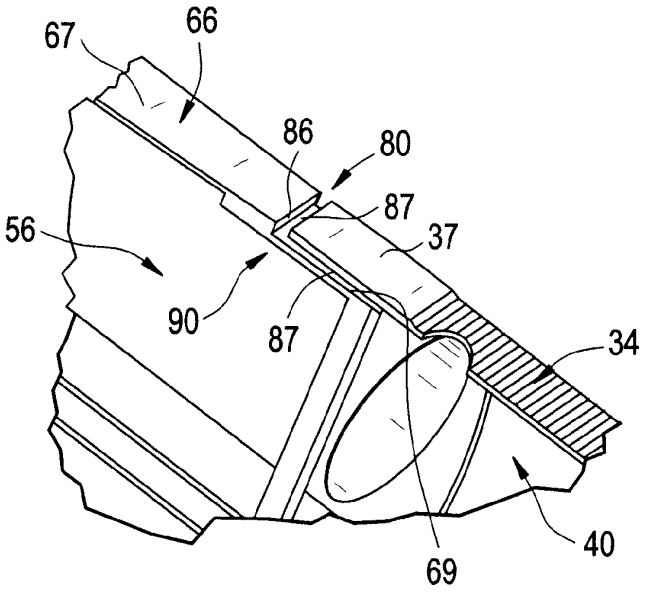
(72) Inventors:
- **Rohrrsen, Robert Joseph**
  Greenville, SC South Carolina 29615 (US)
- **Cihlar, David William**
  Greenville, SC South Carolina 29615 (US)

(74) Representative: **Cleary, Fidelma**
GE International Inc.
Global Patent Operation-Europe
15 John Adam Street
London WC2N 6LU (GB)

(54) Turbomachine combustor assembly including a liner stop

(57) A turbomachine combustor assembly includes a combustor housing and a combustor body. The combustor body defines a combustor liner (34) having a first end portion (37) that extends to a second end portion through a combustion chamber (40). A cap assembly is mounted at the combustor housing. The cap assembly includes an endcover, a plurality of fuel nozzles (56) supported by the end cover, and an outer barrel member (66). The outer barrel member (66) extends about the plurality of fuel nozzles (56). A liner stop (80) is arranged on one of the outer barrel member (66) and the first end portion (37) of the combustor liner (34). The liner stop (80) includes a stepped lip portion (83) that receives the other of the outer barrel member (66) and the first end portion (37) of the combustor liner (34) to form substantially smooth liner to outer barrel interface. The liner stop (80) restricts axial movement of the combustor liner (34) relative to the outer barrel member (66).

FIG. 3



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Description

BACKGROUND OF THE INVENTION

[0001] The subject matter disclosed herein relates to the art of turbomachines and, more particularly, to turbomachine combustor assembly including a liner stop.

[0002] In conventional turbomachines, a first fluid, such as fuel, is directed into a combustor cap prior to being mixed with another fluid, such as air, and combusted in a combustion chamber to form hot gases. The first fluid enters the combustor cap through a fuel manifold joined to the combustor casing. Compressor discharge air passes through a passageway that extends between a cap liner and the combustion chamber into the combustion cap to mix with the fuel. The cap liner is supported in a spaced relationship between the combustion chamber and an outer combustor casing. The combustion cap generally includes several liner stops that engage with the liner to restrict axial movement of the cap liner during turbomachine operation.

BRIEF DESCRIPTION OF THE INVENTION

[0003] According to one aspect, the invention resides in a turbomachine combustor assembly includes a combustor housing having a first end, and a combustor body arranged within the combustor housing. The combustor body defines a combustor liner having a first end portion that extends to a second end portion through a combustion chamber. A cap assembly is mounted at the first end of the combustor housing. The cap assembly includes an endcover, a plurality of fuel nozzles supported by the end cover, and an outer barrel member extending between the end cover and the combustor housing. The outer barrel member extends about the plurality of fuel nozzles. A liner stop is arranged on one of the outer barrel member and the first end portion of the combustor liner. The liner stop includes a stepped lip portion that receives the other of the outer barrel member and the first end portion of the combustor liner to form substantially smooth liner to outer barrel interface. The liner stop restricts axial movement of the combustor liner relative to the outer barrel member.

[0004] According to another aspect, the invention resides in a turbomachine includes a compressor portion, a turbine portion operatively connected to the compressor portion, and a combustor assembly as described above.

[0005] According to yet another aspect, the invention resides in a method of joining a cap assembly to a turbomachine combustor housing includes aligning an outer barrel member carried by the cap assembly with a combustor liner extending about a combustion chamber in the combustor housing, inserting a stepped lip portion provided on one of the outer barrel member and the combustor liner into the other of the outer barrel member and the combustor liner to form a liner to outer barrel interface, and securing the cap assembly to the turbomachine combustor housing.

[0006] These and other advantages and features will become more apparent from the following description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWING

[0007] Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

FIG. 1 is a partial cross-sectional view of a turbomachine including a combustor assembly having a liner stop in accordance with an exemplary embodiment;

FIG. 2 is a partial perspective view of a cap assembly portion of the combustor assembly illustrating a liner stop in accordance with the exemplary embodiment;

FIG. 3 is detail perspective view of the liner stop of FIG. 2; and

FIG. 4 is a partial plan view of the liner stop of FIG. 2.

[0008] The detailed description explains embodiments of the invention, together with advantages and features, by way of example with reference to the drawings.

DETAILED DESCRIPTION OF THE INVENTION

[0009] The terms "axial" and "axially" as used in this application refer to directions and orientations extending substantially parallel to a center longitudinal axis of a combustor assembly. The terms "radial" and "radially" as used in this application refer to directions and orientations extending substantially orthogonally to the center longitudinal axis of the combustor assembly. The terms "upstream" and "downstream" as used in this application refer to directions and orientations relative to an axial flow direction with respect to the center longitudinal axis of the combustor assembly.

[0010] With reference to FIG. 1, a turbomachine in accordance with an exemplary embodiment is indicated generally at 2. Turbomachine 2 includes a compressor portion 4 operatively connected to a turbine portion 6. A combustor assembly 10 fluidly connects compressor portion 4 with turbine portion 6. Compressor portion 4 includes a compressor discharge 14 that passes compressor discharge air into combustor assembly 10. As will be discussed more fully below, a portion of the combustor discharge air is employed for cooling various components of combustor assembly 10, and another portion of the compressor discharge air is mixed with fuel to form a combustible mixture that is combusted to form hot gases. The hot gases pass from combustor assembly 10 through a transition piece 16 into turbine portion 6. Turbine portion 6 converts thermal energy from the hot gases

into mechanical, rotational energy used to power various systems such as generators, pumps and the like.

[0011] In accordance with the exemplary embodiment shown, combustor assembly 10 includes a combustor housing 20 having a first end 22 that extends to a second end (not shown). Combustor assembly 10 includes a combustor body 30 arranged within combustor housing 20. Combustor body 30 defines a combustor liner 34. Combustor liner 34 includes a first end portion 37 that extends to a second end portion 38 through a combustion chamber 40. Combustor assembly 10 also includes an cap assembly 50 mounted at first end 22 of combustor housing 20. Cap assembly 50 includes an end cover 52 and a forward casing 53.

[0012] End cover 52 supports a plurality of fuel nozzles, one of which is indicated at 56, arranged in an annular array. Fuel nozzles 56 extend from end cover 52 toward combustion chamber 40. As will be detailed more fully below, fuel and air are mixed in forward casing 53 forming a combustible mixture that is passed to fuel nozzles 56. The combustible mixture is combusted and expanded in combustion chamber 40 and then passed through transition piece 16 toward turbine portion 6. Forward casing 53 includes a body 60 having a first flange 62 that is operatively connected to first end 22 of combustor housing 20 and a second flange 63 to which is mounted end cover 52. Forward casing 53 includes an outer barrel member 66 that extends about fuel nozzles 56 and defines, in part, a passage (not separately labeled) that conducts compressor discharge air from combustor housing 20 toward end cover 52.

[0013] In accordance with an exemplary embodiment, outer barrel member 66 includes a body member 67 having a first end section 68 that extends to a second end section 69. Second end section 69 abuts first end portion 37 of combustor liner 34. In order to restrict axial movement of combustor liner 34, outer barrel member 66 includes a liner stop 80. Liner stop 80 includes a stepped lip portion 83 provided at second end section 69 of outer barrel member 66. Stepped lip portion 83 includes a first wall section 86 and a second wall section 87. First wall section 86 extends from body member 67 radially toward a centerline (not separately labeled) of combustor assembly 10. Second wall section 87 is radially offset from body member 67 and extends substantially perpendicularly from first wall section 86.

[0014] Cap assembly 50 is positioned at combustor housing 20 with outer barrel member 66 being aligned with combustor liner 34. Cap assembly 50 is mounted and secured to combustor housing 20 with stepped lip portion 83 extending into first end portion 37 of combustor liner 34 forming a substantially smooth liner-to-outer barrel member interface 90. Within this arrangement, first wall section 86 restricts axial movement of combustion liner 34 while stepped lip portion 83 establishes a smooth transition between combustion liner 34 and outer barrel member 66. The smooth transition established between combustion liner 34 and outer barrel portion 66 promotes a substantially laminar flow of compressor discharge air passing from compressor portion 4 along combustor body 30. Thus, not only does liner stop 80 limit or restrict axial movement of combustion liner 34 but also conditions fluid flow to fuel nozzles 56.

[0015] In further accordance with the exemplary embodiment, liner stop 80 is provided with a seal member 94 that includes a plurality of seal segments, one of which is indicated at 96, secured to second wall section 87 to form a hula seal 99. Seal member 94 restricts fluid flow passing over combustion liner 34 toward end cover 52 from escaping through liner-to-outer barrel member interface 90. That is, when outer barrel member 66 inserted into combustion liner 34, first end portion 37 compresses seal member 84 to form a more robust seal at liner-to-outer barrel member interface 90. At this point it should be understood that while shown on outer barrel member 66, stepped lip portion 83 could alternatively be formed on first end portion 37 of combustion liner 34. In addition, while shown with a seal member formed from multiple seal segments, it should be understood that a continuous seal could also be employed.

[0016] While the invention has been described in detail in connection with only a limited number of embodiments, it should be readily understood that the invention is not limited to such disclosed embodiments. Rather, the invention can be modified to incorporate any number of variations, alterations, substitutions or equivalent arrangements not heretofore described, but which are commensurate with the spirit and scope of the invention. Additionally, while various embodiments of the invention have been described, it is to be understood that aspects of the invention may include only some of the described embodiments. Accordingly, the invention is not to be seen as limited by the foregoing description, but is only limited by the scope of the appended claims.

Claims

1. A turbomachine combustor assembly (10) comprising:

a combustor housing (20) having a first end (22);
a combustor body (30) arranged within the combustor housing (20), the combustor body (30) defining a combustor liner having a first end portion (37) that extends to a second end portion (38) through a combustion chamber (40);
a cap assembly (50) mounted at the first end (22) of the combustor housing (20), the cap assembly (50) including an endcover (52), a plurality of fuel nozzles supported by the end cover (52) and an outer barrel member (66) extending between the end cover (52) and the combustor housing (20), the outer barrel member (66) extending about the plurality of fuel nozzles; and
a liner stop (80) arranged on one of the outer

barrel member (66) and the first end portion (37) of the combustor liner (34), the liner stop (80) including a stepped lip portion (83) that receives the other of the outer barrel member (66) and the first end portion (37) of the combustor liner (34) to form a substantially smooth liner-to-outer barrel interface (90), the liner stop (80) restricting axial movement of the combustor liner (34) relative to the outer barrel member (66).

2. The turbomachine combustor assembly (10) according to claim 1, further comprising: a seal member (94) arranged at the substantially smooth liner to outer barrel interface (90).

3. The turbomachine combustor assembly (10) according to claim 2, wherein the seal member (94) is provided on the stepped lip portion (83).

4. The turbomachine combustor assembly (10) according to claim 2 or 3, wherein the seal member (94) extends radially about the outer barrel member (66) at the stepped lip portion (83).

5. The turbomachine combustor assembly (10) according to any of claims 2 to 4, wherein the seal member (94) comprises a hula seal (99).

6. The turbomachine combustor assembly (10) according to any preceding claim, wherein the substantially smooth liner-to-outer barrel interface (90) is configured and disposed to condition a fluid flow passing over the combustor liner (34) toward the end cover (52).

7. The turbomachine combustor assembly (10) according to claim 6, wherein the stepped lip portion (83) is configured and disposed to promote a substantially laminar flow across the substantially smooth liner to outer barrel interface (90).

8. The turbomachine combustor assembly (10) according to any preceding claim, wherein the liner stop (80) is provided on the outer barrel member (66).

9. A turbomachine comprising:

a compressor portion;
a turbine portion operatively connected to the compressor portion; and
a combustor assembly fluidly connecting the compressor portion and the turbine portion, the combustor assembly as recited in any of claims 1 to 8.

10. A method of joining a cap assembly (50) to a turbomachine combustor housing (20), the method comprising:

aligning an outer barrel member (66) carried by the cap assembly (50) with a combustor liner (34) extending about a combustion chamber (40) in the combustor housing (20);
inserting a stepped lip portion (83) provided on one of the outer barrel member (66) and the combustor liner (34) into the other of the outer barrel member (66) and the combustor liner (34) to form a liner to outer barrel interface (90); and
securing the cap assembly (50) to the turbomachine combustor housing (20).

11. The method of claim 10, further comprising: sealing the combustor liner (34) to outer barrel interface (60).

12. The method of claim 10 or 11, wherein inserting the stepped lip portion (83) provided on one of the outer barrel member (66) and the combustor liner (34) into the other of the outer barrel member (66) and the combustor liner (34) includes compressing seal (94) provided on the stepped lip portion (60).

13. The method of any of claims 10 to 12, further comprising: restricting axial movement of the combustor liner (34) relative to the outer barrel member (66) with the stepped lip portion (83).

FIG. 1

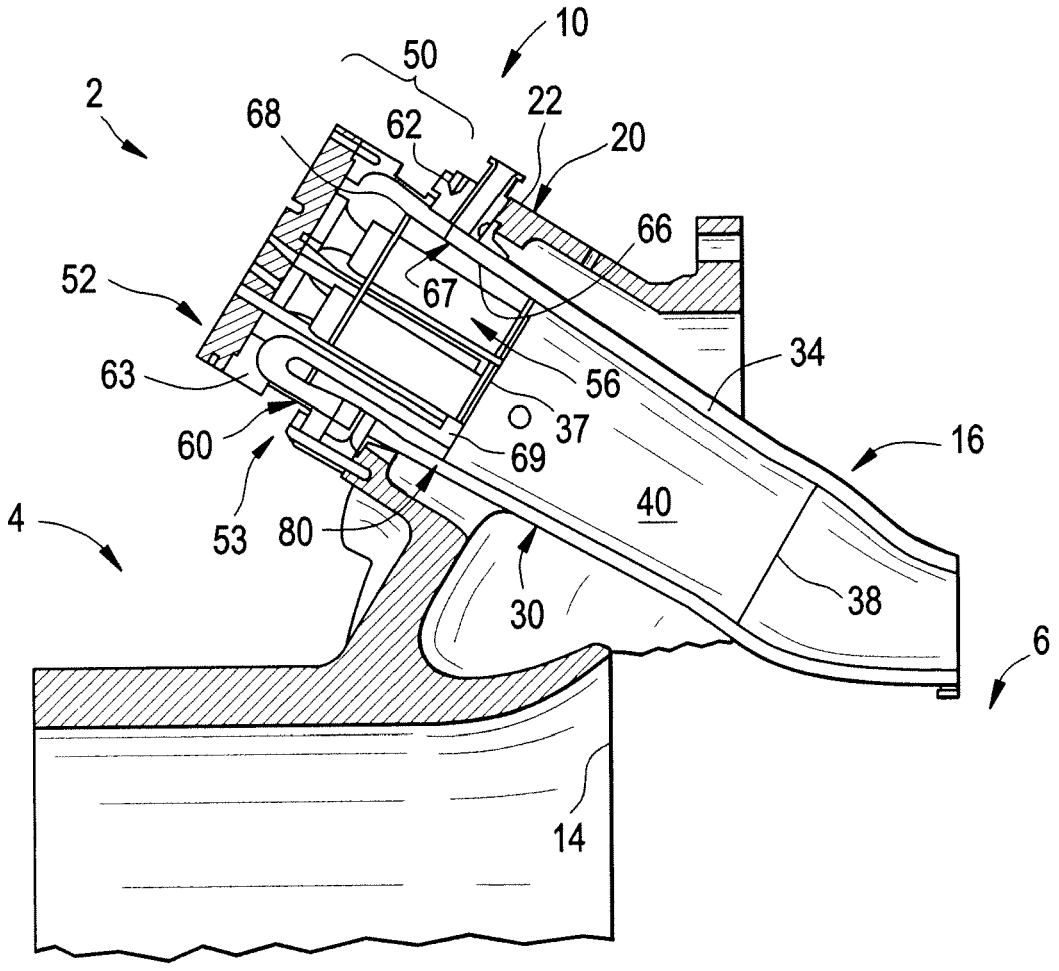

FIG. 2

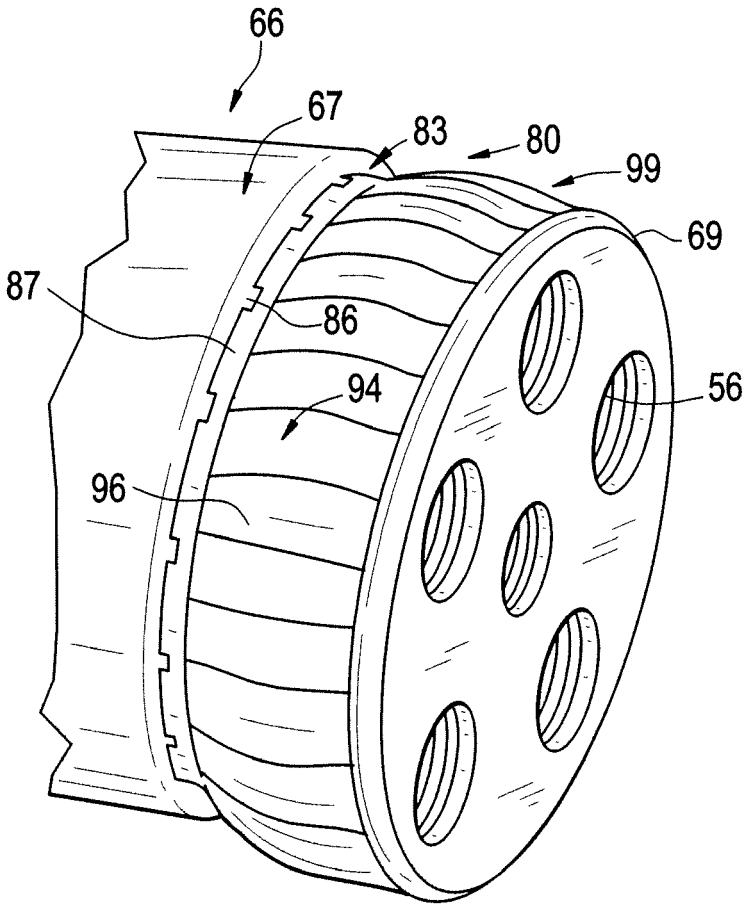

FIG. 3

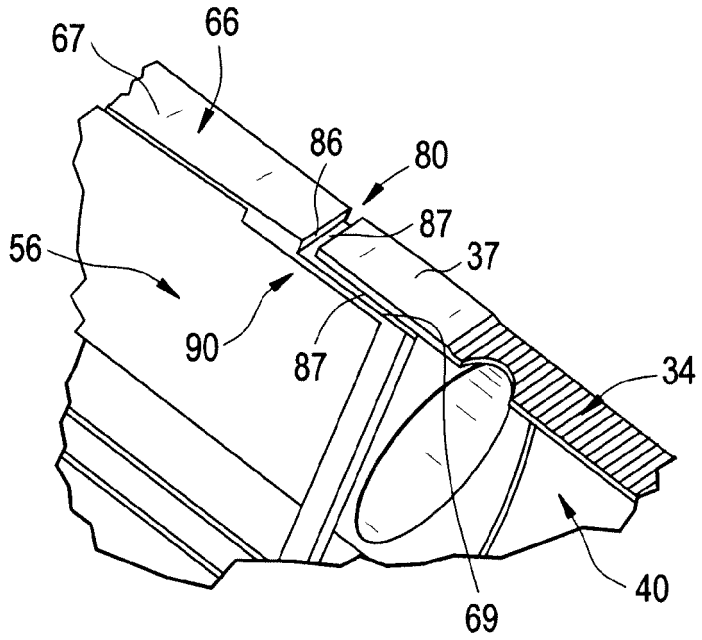

FIG. 4