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(54) BLADE OUTER AIR SEAL

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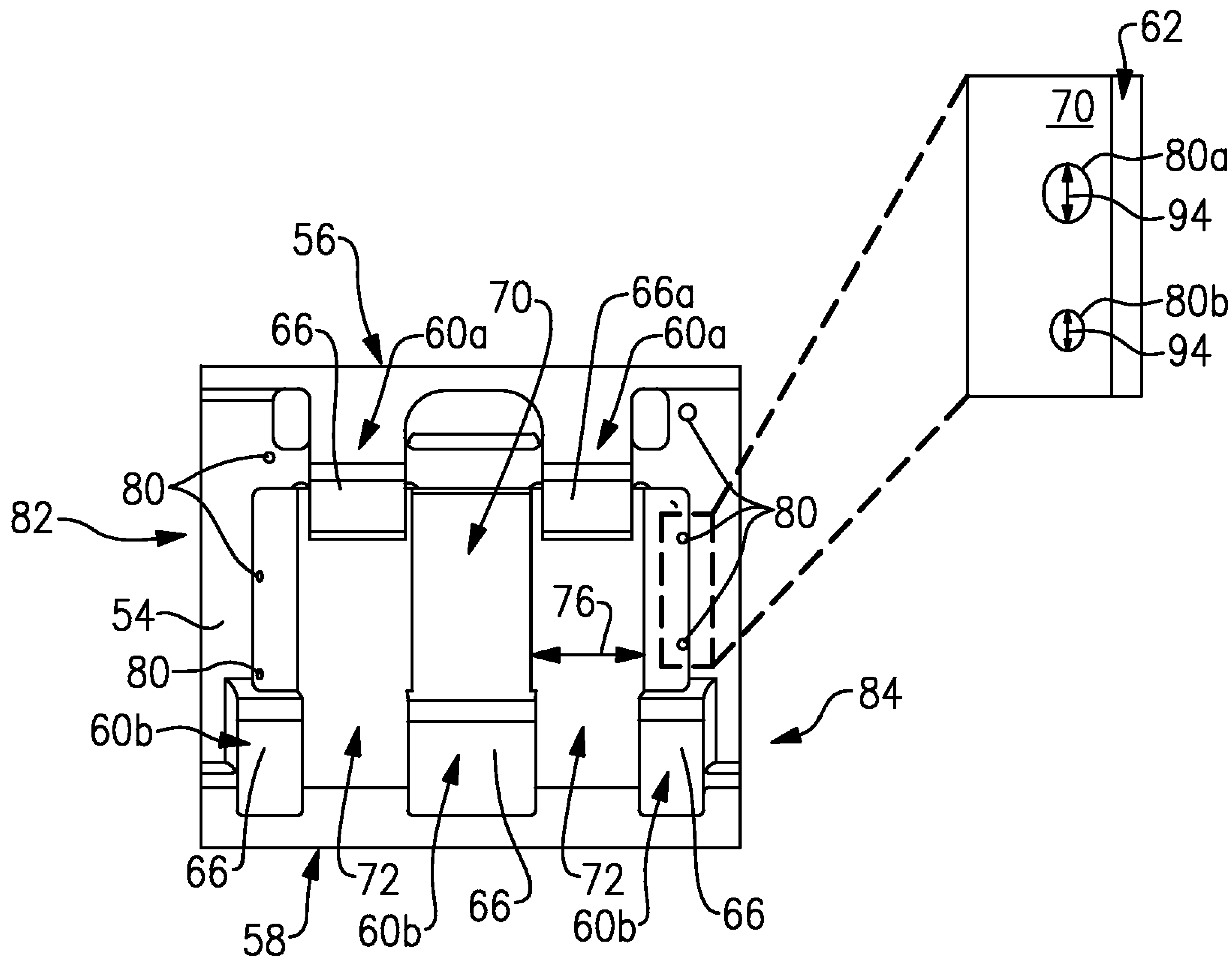
(57) **ABSTRACT**

An example blade outer air seal assembly for a gas turbine engine includes a main body portion extending along an axis. The main body portion has a radially inward facing surface and at least one radially outward facing surface. A passage is provided in the main body portion between the at least one radially inward facing surface and the at least one radially outward facing surface. The passage has a first portion and a second portion transverse to the first portion, and at least one rib disposed along the axis radially outward of the second portion.



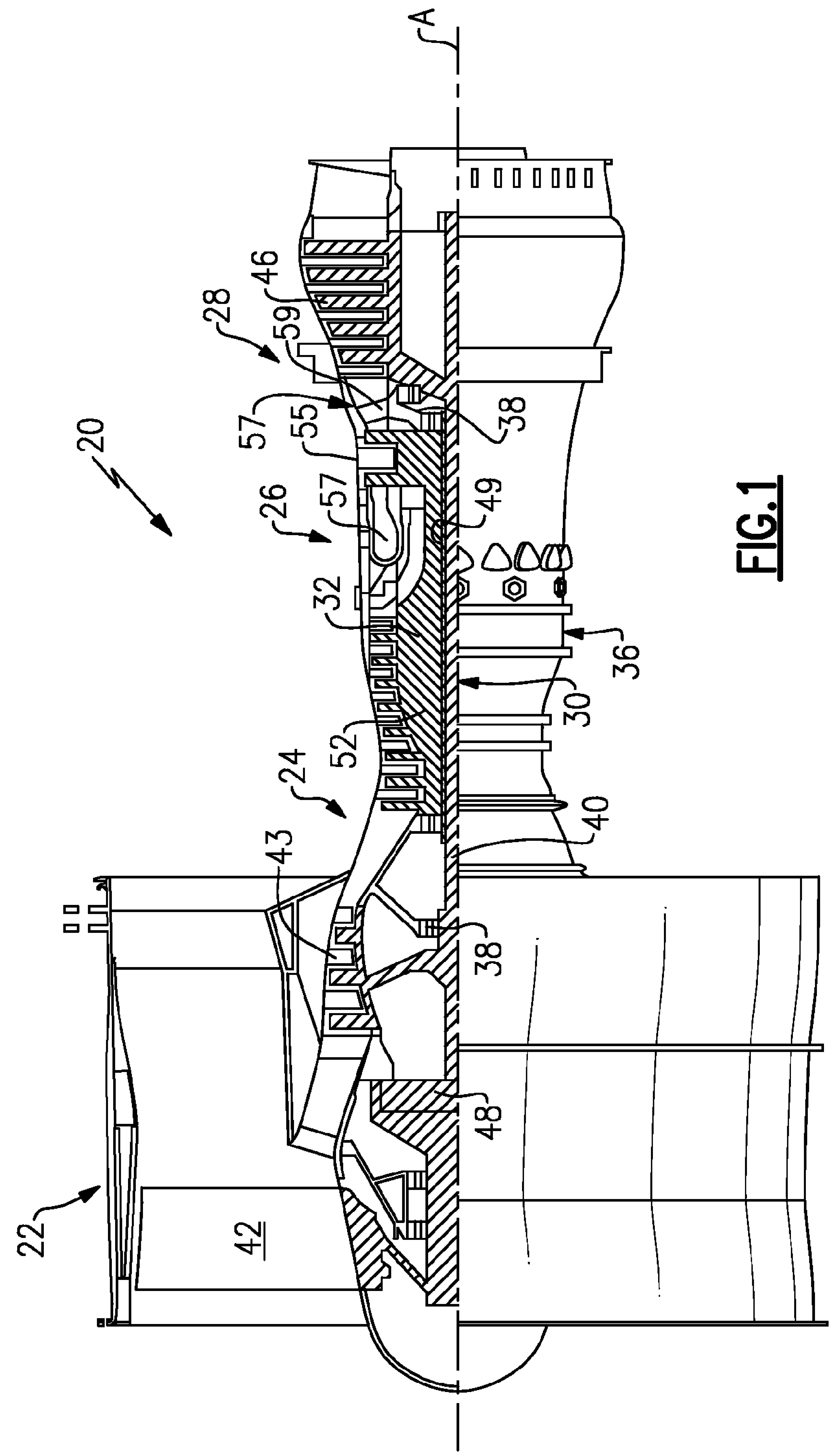


FIG.1

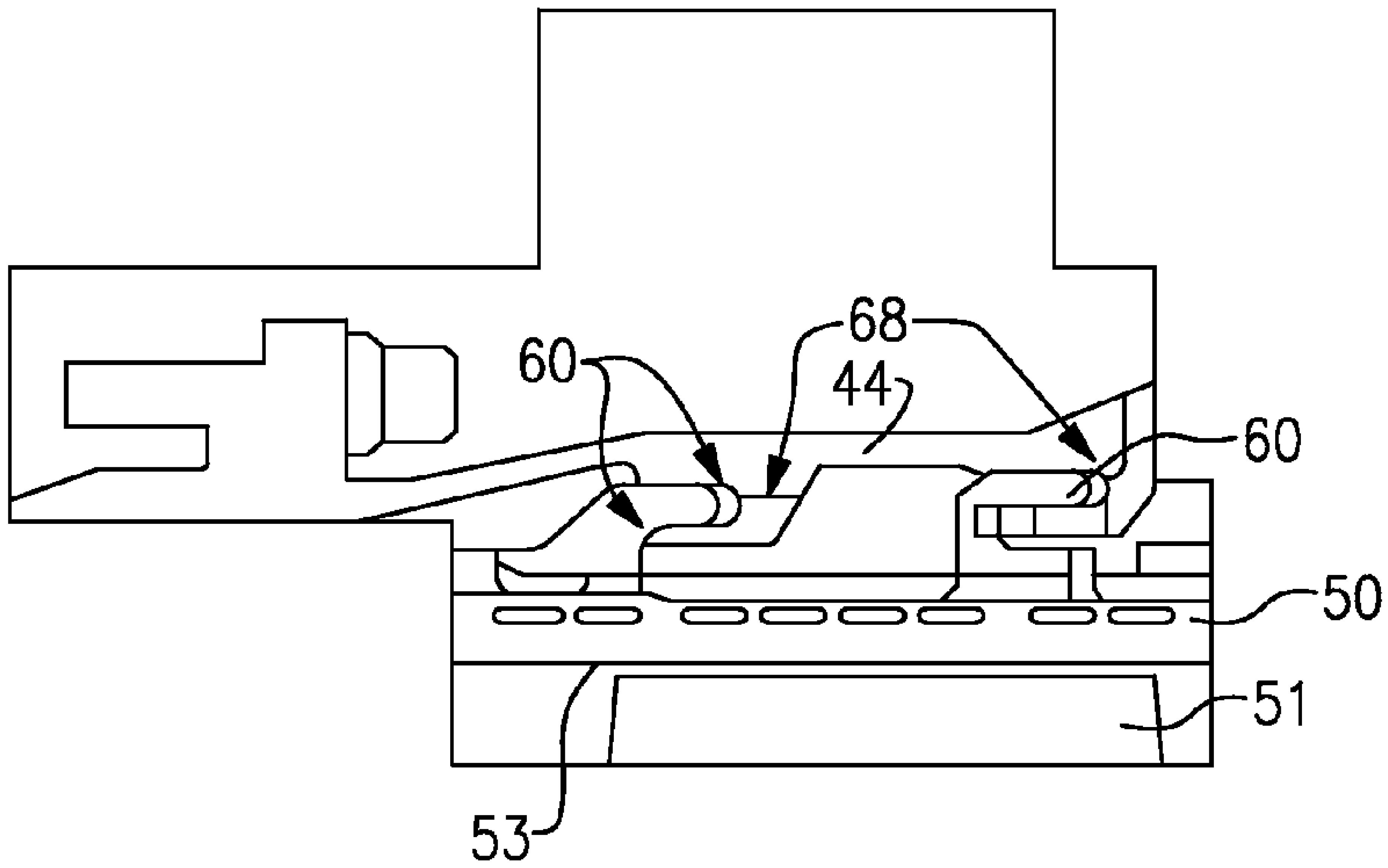
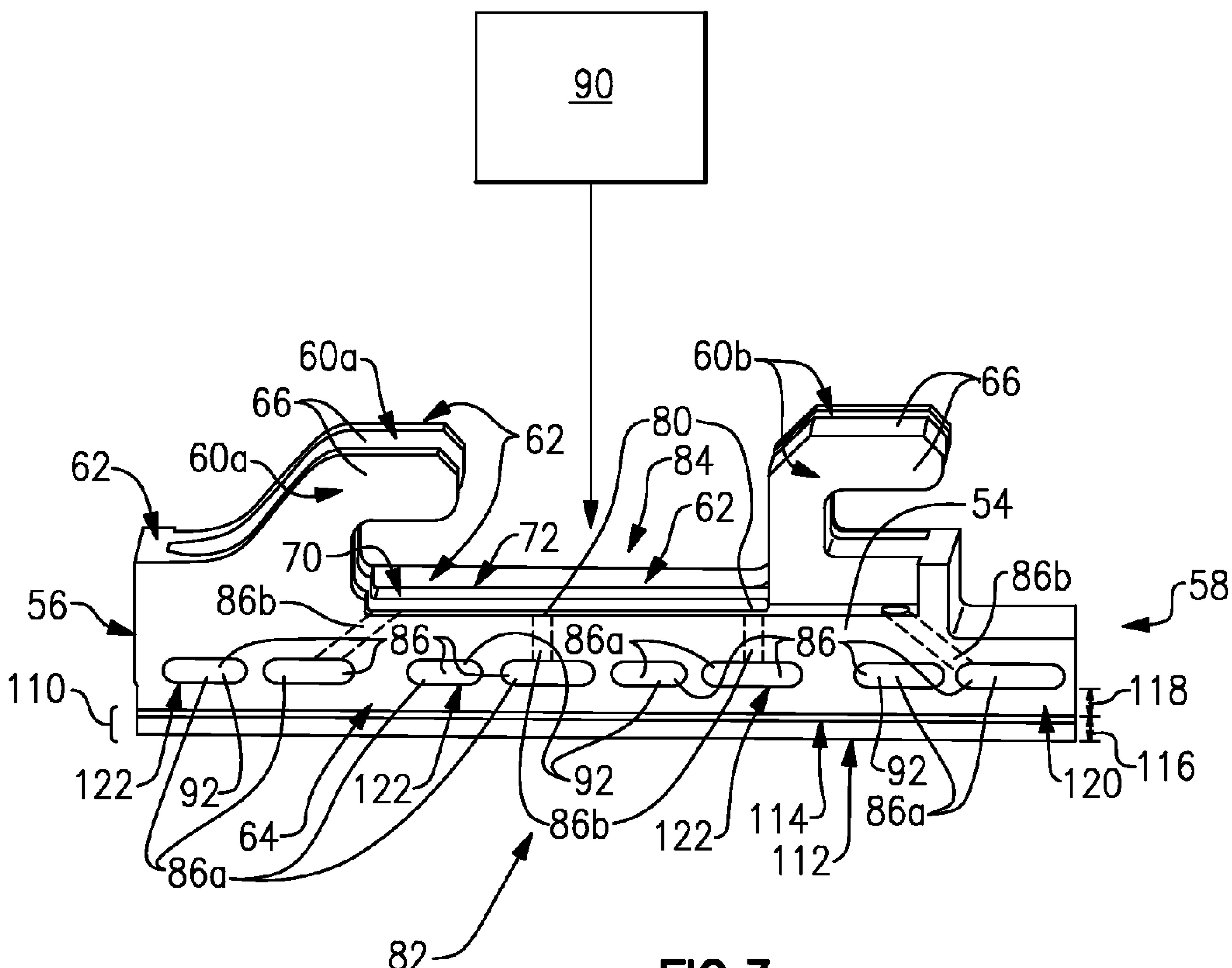

60
68
44
60
50
51
53

FIG.2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60a
66
60a
62
62
70
72
80
84
62
60b
66
54
86b
56
86b
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86a
86
58
110
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64
122
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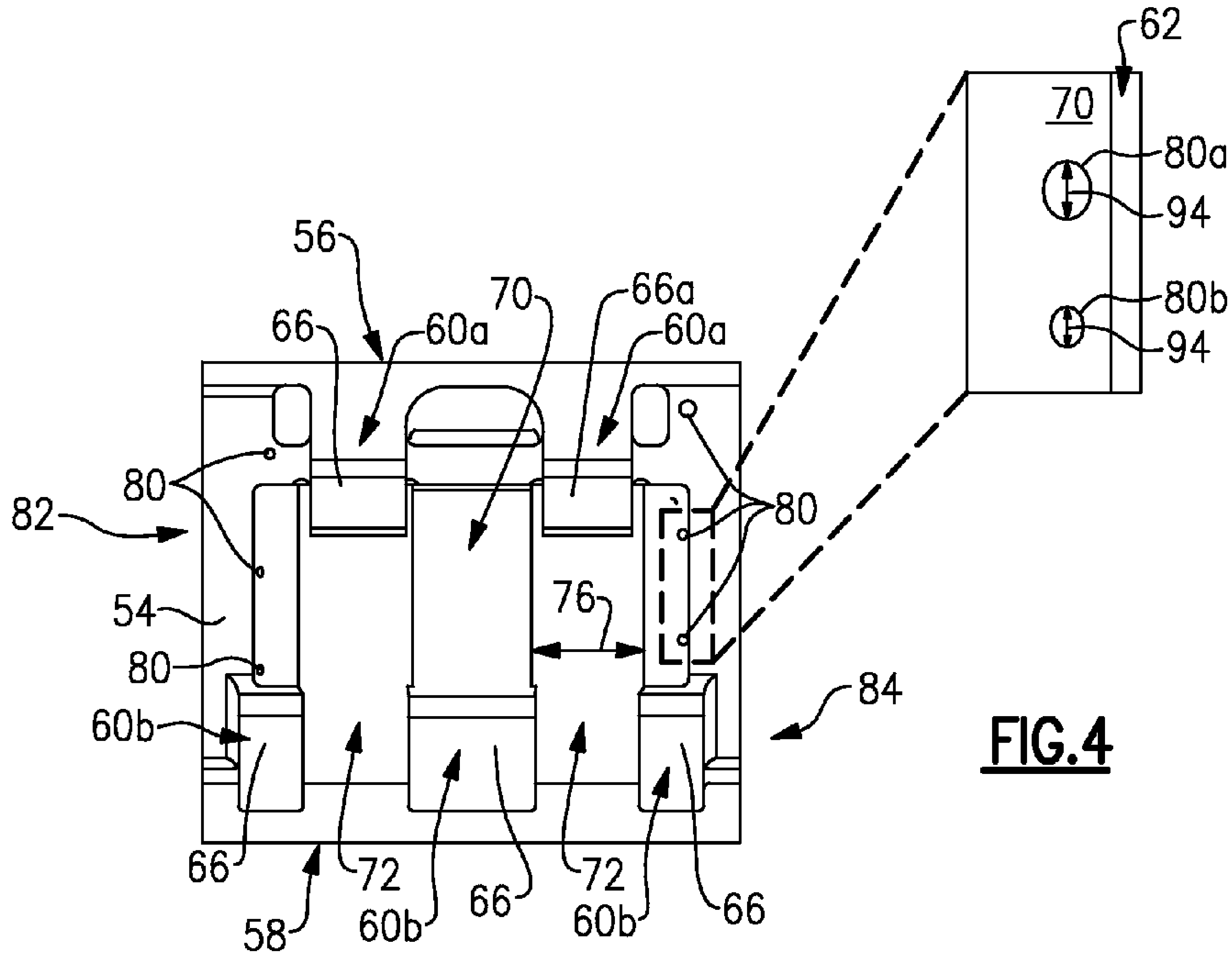
86b
122
114
112
92
86a
120
116
86a
82

FIG.3


62
70
80a
94
80b
94
56
70
66a
66
60a
60a
80
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82
54
76
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84
60b
66
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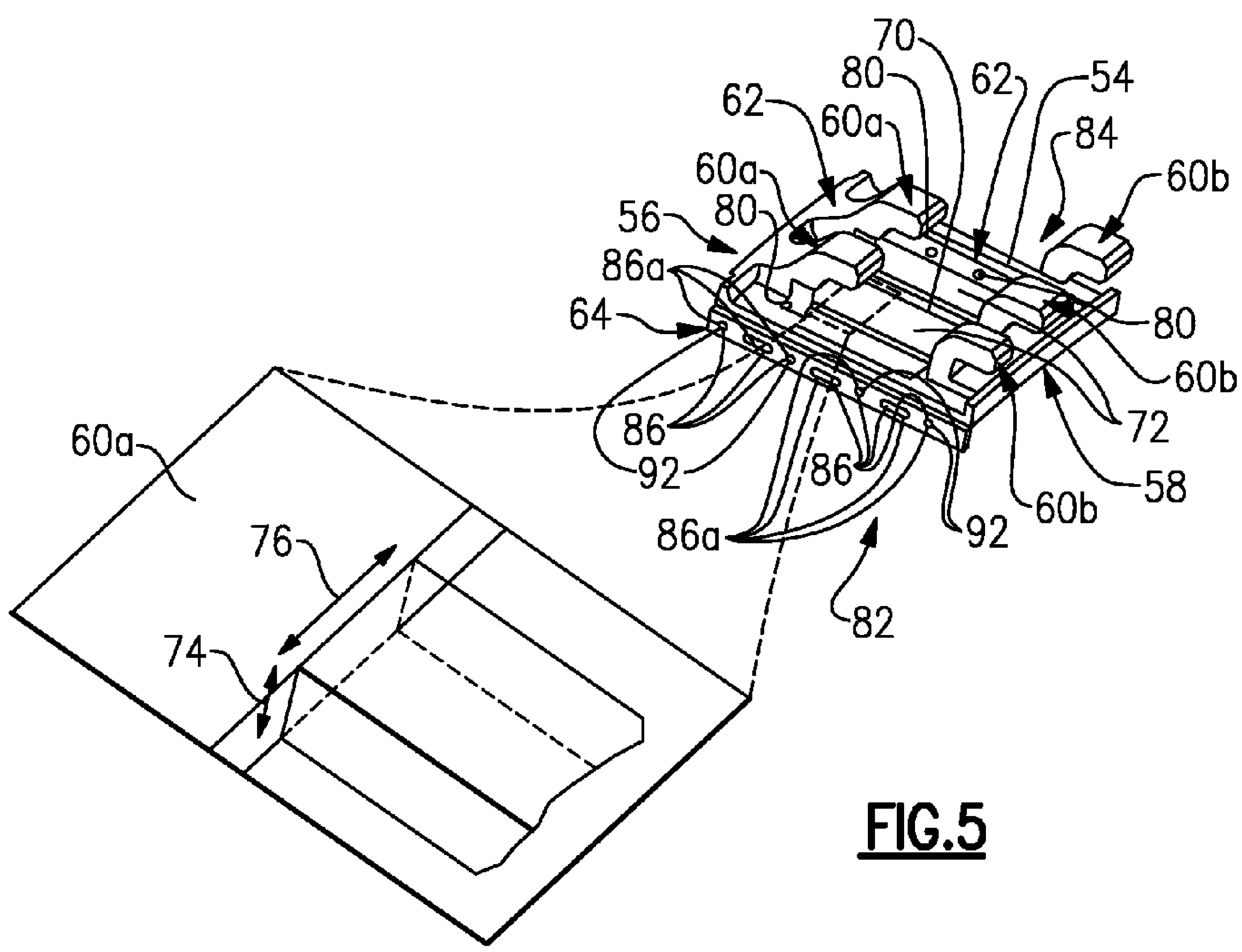
72
60b
66
58
60b

FIG.4


70
80
62
54
62
60a
84
60b
60a
56
80
86a
80
64
60b
72
86
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86a
82
60a
76
74

FIG.5

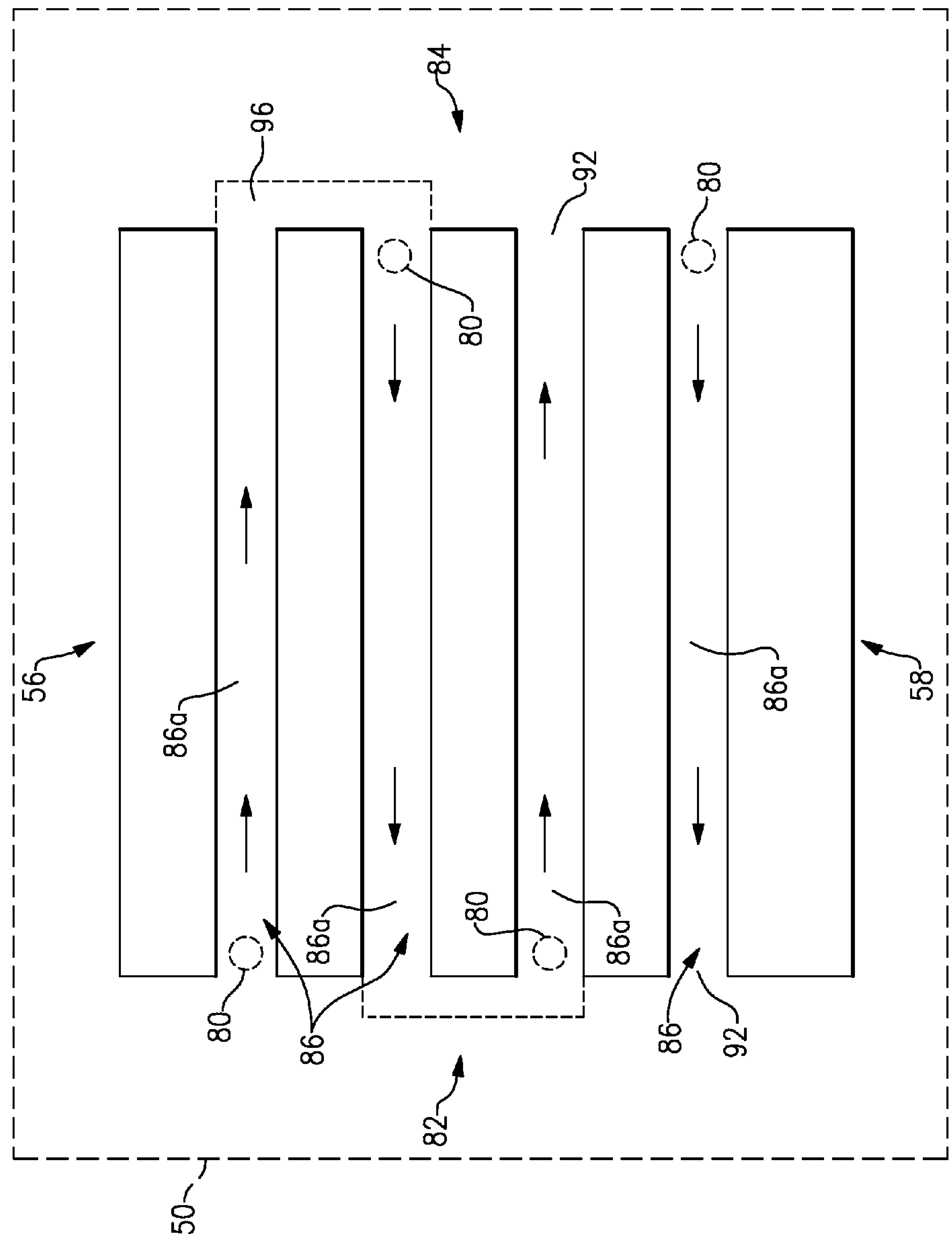

FIG.6

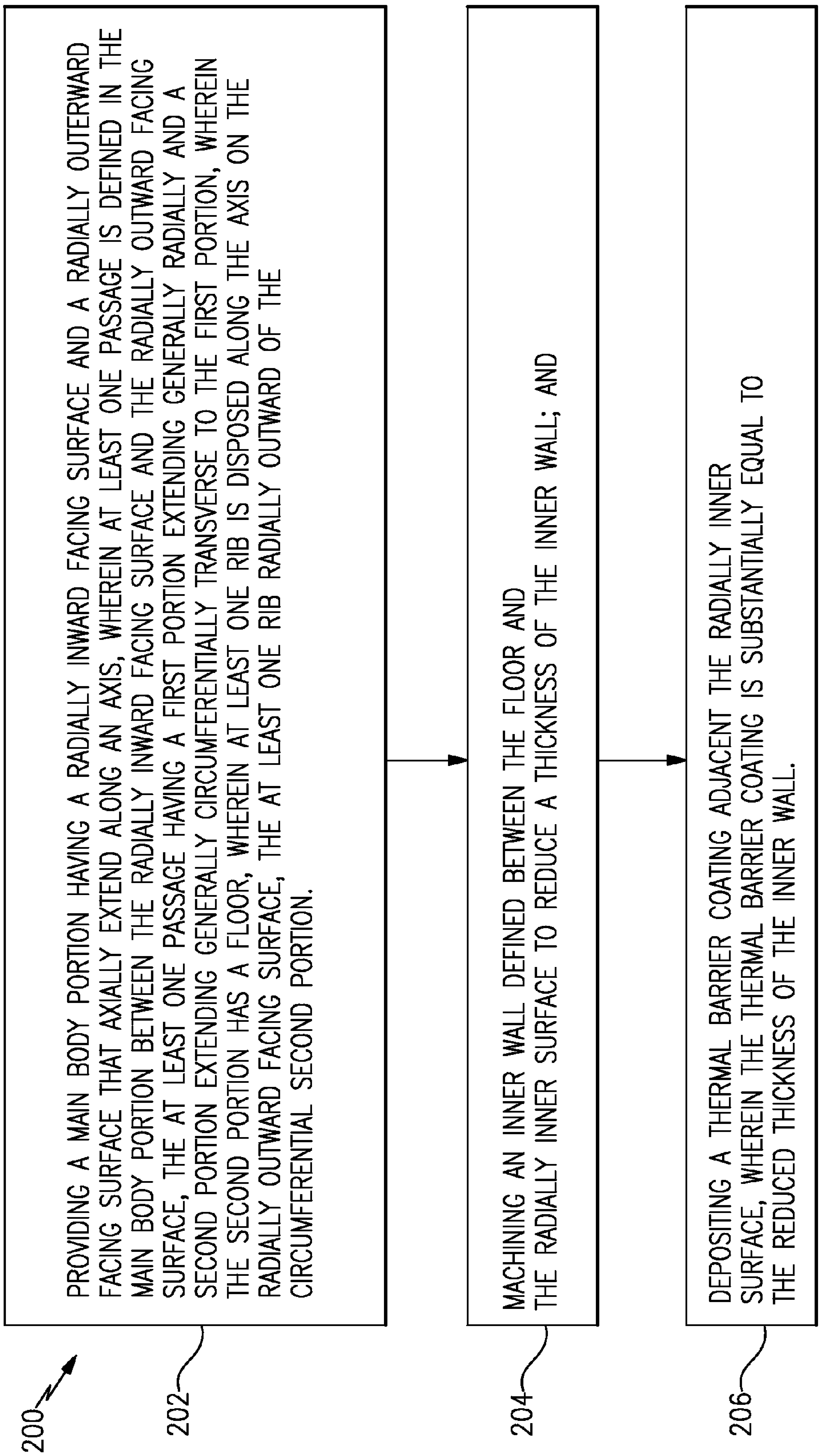
200
202
PROVIDING A MAIN BODY PORTION HAVING A RADIALLY INWARD FACING SURFACE AND A RADIALLY OUTERWARD FACING SURFACE THAT AXIALLY EXTEND ALONG AN AXIS, WHEREIN AT LEAST ONE PASSAGE IS DEFINED IN THE MAIN BODY PORTION BETWEEN THE RADIALLY INWARD FACING SURFACE AND THE RADIALLY OUTWARD FACING SURFACE, THE AT LEAST ONE PASSAGE HAVING A FIRST PORTION EXTENDING GENERALLY RADIALLY AND A SECOND PORTION EXTENDING GENERALLY CIRCUMFERENTIALLY TRANSVERSE TO THE FIRST PORTION, WHEREIN THE SECOND PORTION HAS A FLOOR, WHEREIN AT LEAST ONE RIB IS DISPOSED ALONG THE AXIS ON THE RADIALLY OUTWARD FACING SURFACE, THE AT LEAST ONE RIB RADIALLY OUTWARD OF THE CIRCUMFERENTIAL SECOND PORTION.
204
MACHINING AN INNER WALL DEFINED BETWEEN THE FLOOR AND THE RADIALLY INNER SURFACE TO REDUCE A THICKNESS OF THE INNER WALL; AND
206
DEPOSITING A THERMAL BARRIER COATING ADJACENT THE RADIALLY INNER SURFACE, WHEREIN THE THERMAL BARRIER COATING IS SUBSTANTIALLY EQUAL TO THE REDUCED THICKNESS OF THE INNER WALL.

FIG.7

BLADE OUTER AIR SEAL

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0001] This disclosure was made with Government support under N00019-12-D-0002-4Y01 awarded by The United States Navy. The Government has certain rights in this disclosure.

BACKGROUND

[0002] This disclosure relates generally to a blade outer air seal and, more particularly, to enhancing the performance of a blade outer air seal.

[0003] As known, gas turbine engines, and other turbomachines, include multiple sections, such as a fan section, a compressor section, a combustor section, a turbine section, and an exhaust section. Air moves into the engine through the fan section. Airfoil arrays in the compressor section rotate to compress the air, which is then mixed with fuel and combusted in the combustor section. The products of combustion are expanded to rotatably drive airfoil arrays in the turbine section. Rotating the airfoil arrays in the turbine section drives rotation of the fan and compressor sections.

[0004] A blade outer air seal arrangement includes multiple blade outer air seals circumferentially disposed about at least some of the airfoil arrays. The tips of the blades within the airfoil arrays seal against the blade outer air seals during operation. Improving and maintaining the sealing relationship between the blades and the blade outer air seals enhances performance of the turbomachine. As known, the blade outer air seal environment is exposed to temperature extremes and other harsh environmental conditions, both of which can affect the integrity of the blade outer air seal and the sealing relationship.

SUMMARY

[0005] An example blade outer air seal assembly for a gas turbine engine includes a main body portion extending along an axis. The main body portion has a radially inward facing surface and at least one radially outward facing surface. A passage is provided in the main body portion between the at least one radially inward facing surface and the at least one radially outward facing surface. The passage has a first portion and a second portion transverse to the first portion, and at least one rib disposed along the axis radially outward of the second portion.

[0006] In a further non-limiting embodiment according to the previous assembly, the at least one rib is at least partially in a cavity that opens in a radially outward facing direction. The at least one rib comprises one of the radially outward facing surfaces.

[0007] In a further non-limiting embodiment according to any of the previous assemblies, at least one airflow inlet is provided by one of the radially outward facing surfaces.

[0008] In a further non-limiting embodiment according to any of the previous assemblies, the at least one airflow inlet includes a first airflow inlet opening to the cavity.

[0009] In a further non-limiting embodiment according to any of the previous assemblies, at least one attachment portion is disposed at both a leading edge of the main body portion and a trailing edge of the main body portion. Each of the at least one attachment portions has a flange extending axially aft.

[0010] In a further non-limiting embodiment according to any of the previous assemblies, the at least one rib is circumferentially aligned with one of the attachment portions disposed at the leading edge.

[0011] In a further non-limiting embodiment according to any of the previous assemblies, at least one fluid outlet is disposed at a circumferential end of the main body portion radially outward of the radially inward facing surface.

[0012] In a further non-limiting embodiment according to any of the previous assemblies, at least one airflow inlet is provided by one of the radially outward facing surfaces. The at least a first airflow inlet includes at least a first airflow inlet having a cross-section greater than a second airflow inlet.

[0013] In a further non-limiting embodiment according to any of the previous assemblies, the main body portion comprises a single crystal nickel alloy having a sulfur content that is equal to or below 1 part per million.

[0014] In a further non-limiting embodiment according to any of the previous assemblies, a thermal barrier coating is disposed adjacent the radially inward facing surface. A thickness of the thermal barrier coating is substantially equal to a thickness of an inner wall of the main body portion defined between a floor of each of the at least one passages and the radially inward facing surface.

[0015] In a further non-limiting embodiment according to any of the previous assemblies, the passage is entirely radially outward of the thermal barrier coating.

[0016] In a further non-limiting embodiment according to any of the previous assemblies, the second portion is radially inward of the first portion.

[0017] In a further non-limiting embodiment according to any of the previous assemblies, at least one of the radially outward facing surfaces is exposed.

[0018] An example gas turbine engine assembly includes a plurality of blade outer air seal assemblies each configured to attach to a casing and disposed circumferentially about an engine axis. The blade outer air seal assemblies each have a main body portion with a radially inward facing surface and a radially outward facing surface. At least one passage is defined in the main body portion between the radially inward facing surface and the radially outward facing surface. The main body portion has an inner wall having a first thickness defined between a floor of each of the at least one passages and the radially inward facing surface. A thermal barrier coating adjacent to the radially inward facing surface. The thermal barrier coating has a second thickness that is substantially equal to the first thickness.

[0019] In a further non-limiting embodiment according to the previous gas turbine engine assembly, at least one airflow inlet is opening to the radially outward facing surface. The at least one of passage is generally perpendicular to the engine axis. The at least one passage is in fluid communication with the at least one inlet and configured to receive cooling air flow.

[0020] In a further non-limiting embodiment according to any of the previous gas turbine engine assemblies, the at least one passage includes a first passage in fluid communication with a first airflow inlet of the at least one airflow inlets having airflow greater than a second passage in fluid communication with the second airflow inlet.

[0021] In a further non-limiting embodiment according to any of the previous gas turbine engine assemblies, the first airflow inlet has a cross-section greater than the second airflow inlet.

[0022] In a further non-limiting embodiment according to any of the previous gas turbine engine assemblies, an airflow source communicates compressor bleed air to the at least one inlet.

[0023] In a further non-limiting embodiment according to any of the previous gas turbine engine assemblies, each of the plurality of blade outer air seal assemblies includes at least one attachment portion disposed at each of a leading edge of the main body portion and a trailing edge of the main body portion. Each of the at least one attachment portions have a flange extending axially aft. Each of the at least one attachment portions aligned with corresponding receiving portion of the casing attaches the plurality of BOAS assemblies to the casing.

[0024] In a further non-limiting embodiment according to any of the previous gas turbine engine assemblies, at least at least one rib is disposed along the engine axis radially outward of the second portion.

[0025] An example method of forming a blade outer air seal for a gas turbine engine includes providing a main body portion having a radially inward facing surface and a radially outward facing surface that axially extend along an axis. At least one passage is defined in the main body portion between the radially inward facing surface and the radially outward facing surface. The at least one passage has a first portion extending generally radially and a second portion extending generally circumferentially transverse to the first portion. The second portion has a floor. At least one rib is disposed along the axis on the radially outward facing surface. The at least one rib is radially outward of the circumferential second portion. An inner wall defined between the floor and the radially inward facing surface is machined to reduce a thickness of the inner wall. A thermal barrier coating is deposited adjacent the radially inward facing surface. The thermal barrier coating is substantially equal to the reduced thickness of the inner wall.

[0026] In a further non-limiting embodiment according to the previous method, at least one airflow inlet opening to the radially outward facing surface is formed. The at least one passage is in fluid communication with the at least one inlet and configured to receive cooling air flow.

[0027] These and other features of the disclosed examples can be best understood from the following specification and drawings, the following of which is a brief description.

BRIEF DESCRIPTION OF THE FIGURES

[0028] FIG. **1** shows a cross-section of an example turbomachine.

[0029] FIG. **2** shows a cross-section of an example turbine section of the turbomachine of FIG. **1**.

[0030] FIG. **3** shows a perspective view of a blade outer air seal assembly of the turbine section of FIG. **2**.

[0031] FIG. **4** shows a top view of the blade outer air seal assembly of the turbine section of FIG. **2**.

[0032] FIG. **5** shows another perspective view of the blade outer air seal assembly of the turbine section of FIG. **2**.

[0033] FIG. **6** shows top cross-sectional view of the blade outer air seal assembly of the turbine section of FIG. **2**.

[0034] FIG. **7** shows method of forming a blade outer air seal assembly.

DETAILED DESCRIPTION

[0035] Referring to FIG. **1**, a gas turbine engine **20** is schematically illustrated. The gas turbine engine **20** is disclosed herein as a two-spool turbofan that generally incorporates a fan section **22**, a compressor section **24**, a combustor section **26** and a turbine section **28**. Alternative engines might include an augmentor section (not shown) among other systems or features. The fan section **22** drives air along a bypass flowpath while the compressor section **24** drives air along a core flowpath for compression and communication into the combustor section **26** then expansion through the turbine section **28**. Although depicted as a turbofan gas turbine engine in the disclosed non-limiting embodiment, it should be understood that the concepts described herein are not limited to use with turbofans as the teachings may be applied to other types of turbine engines including three-spool architectures, non-geared turbine engines, and land-based turbines.

[0036] The engine **20** generally includes a first spool **30** and a second spool **32** mounted for rotation about an engine central axis A relative to an engine static structure **36** via several bearing systems **38**. It should be understood that various bearing systems **38** at various locations may alternatively or additionally be provided.

[0037] The first spool **30** generally includes a first shaft **40** that interconnects a fan **42**, a first compressor **43** and a first turbine **46**. The first shaft **40** is connected to the fan **42** through a gear assembly of a fan drive gear system **48** to drive the fan **42** at a lower speed than the first spool **30**. The second spool **32** includes a second shaft **49** that interconnects a second compressor **52** and second turbine **55**. The first spool **30** runs at a relatively lower pressure than the second spool **32**. It is to be understood that "low pressure" and "high pressure" or variations thereof as used herein are relative terms indicating that the high pressure is greater than the low pressure. An annular combustor **57** is arranged between the second compressor **52** and the second turbine **55**. The first shaft **40** and the second shaft **49** are concentric and rotate via bearing systems **38** about the engine central axis A which is collinear with their longitudinal axes.

[0038] The core airflow is compressed by the first compressor **43** then the second compressor **52**, mixed and burned with fuel in the annular combustor **57**, then expanded over the second turbine **55** and first turbine **46**. The first turbine **46** and the second turbine **55** rotationally drive, respectively, the first spool **30** and the second spool **32** in response to the expansion.

[0039] The engine **20** is a high-bypass geared aircraft engine that has a bypass ratio that is greater than about six (6), with an example embodiment being greater than ten (10), the gear assembly of the fan drive gear system **48** is an epicyclic gear train, such as a planetary gear system or other gear system, with a gear reduction ratio of greater than about 2.3:1 and the first turbine **46** has a pressure ratio that is greater than about 5. The first turbine **46** pressure ratio is pressure measured prior to inlet of first turbine **46** as related to the pressure at the outlet of the first turbine **46** prior to an exhaust nozzle. The first turbine **46** has a maximum rotor diameter and the fan **42** has a fan diameter such that a ratio of the maximum rotor diameter divided by the fan diameter is less than 0.6. It should be understood, however, that the above parameters are only exemplary.

[0040] A significant amount of thrust is provided by the bypass flow B due to the high bypass ratio. The fan section **22** of the engine **20** is designed for a particular flight condition—typically cruise at about 0.8 Mach and about 35,000 feet. The flight condition of 0.8 Mach and 35,000 feet, with the engine at its best fuel consumption. To make an accurate comparison of fuel consumption between engines, fuel consumption is reduced to a common denominator, which is applicable to all types and sizes of turbojets and turbofans. The term is thrust specific fuel consumption, or TSFC. This is an engine's fuel consumption in pounds per hour divided by the net thrust. The result is the amount of fuel required to produce one pound of thrust. The TSFC unit is pounds per hour per pounds of thrust (lb/hr/lb Fn). When it is obvious that the reference is to a turbojet or turbofan engine, TSFC is often simply called specific fuel consumption, or SFC. "Low fan pressure ratio" is the pressure ratio across the fan blade alone, without a Fan Exit Guide Vane system. The low fan pressure ratio as disclosed herein according to one non-limiting embodiment is less than about 1.45. "Low corrected fan tip speed" is the actual fan tip speed in feet per second divided by an industry standard temperature correction of $[(\text{Tram}°\text{R})/(518.7°\text{R})]^{0.5}$. The "Low corrected fan tip speed" as disclosed herein according to one non-limiting embodiment is less than about 1150 feet per second.

[0041] Referring to FIG. **2**, an example blade outer air seal (BOAS) assembly **50** is attached to an inner engine case structure **44** of the gas turbine engine **10** by a receiving portion **68** of the inner engine case structure **44**. In this example, the BOAS assembly **50** is located within the turbine section **28** of the gas turbine engine **20**. The BOAS assembly **50** faces turbine blade **51** to define a radial tip clearance **53** between the turbine blade **51** and the BOAS assembly **50**. Although only one BOAS assembly **50** is shown, a number of BOAS assembly **50** are arranged circumferentially about engine axis A to form a shroud. Alternatively, the BOAS assemblies **50** may be formed as a unitary BOAS structure, with the same features described herein.

[0042] Referring to FIGS. **3-6**, the BOAS assembly **50** includes a main body portion **54** that extends generally axially from a leading edge portion **56** to a trailing edge portion **58** and from a radially outward facing surface **62** to a radially inward facing surface **64**. The BOAS assembly **50** also includes at least one leading attachment portion **60***a* ("attachment portions **60***a*") disposed at or near the leading edge portion **56** and at least one trailing attachment portion **60***b* ("attachment portions **60***b*") disposed at or near the trailing edge portion **58**. Each of the attachment portions **60***a*, **60***b* define a flange **66** extending in an axially aft direction. Each axially extending flange **66** corresponds to the receiving portion **68** of the inner engine case structure **44** to support and attach the BOAS assembly **50** (Shown in FIG. **2**). In this example, the attachment portions **60***a* may be circumferentially offset, circumferentially aligned, or a combination of both, from the attachment portions **60***b* in response to BOAS assembly **50** parameters.

[0043] In this example, the BOAS assembly **50** includes a cavity **70** opening to the radially outward facing surface **62** between the attachment portions **60***a* and the attachment portions **60***b*. It is understood that other configurations of cavity **70** are contemplated by this disclosure.

[0044] In this example, the main body portion **54** establishes at least one rib **72** circumferentially aligned with corresponding attachment portion **60***a* and circumferentially offset from attachment portions **60***b*. The at least one rib **72** is disposed at least partially within the cavity **70** and extends axially from corresponding attachment portion **60***a* within the cavity **70** to the trailing edge portion **58** adjacent attachment portions **60***b*. In another example, the at least one rib **72** is circumferentially aligned with corresponding attachment portions **60***a* and attachment portion **60***b* and extends axially from attachment portion **60***a* to corresponding attachment portion **60***b*. A ratio of the height **74** in the radial direction of the at least one rib **72** to the width **76** in the circumferential direction of the at least one rib **72** is between 1:1 and 1:10.

[0045] In this example, a plurality of fluid inlets **80** open to the radially outward facing surface **62** near a first circumferential end **82** and a second circumferential end **84** of the main body portion **54**. The fluid inlets **80** may be located in the cavity **70** or alternatively at other positions on the radially outward facing surface **62**. The fluid inlets **80** are varied in size based on pre-determined cooling parameters. Fluid inlets **80***a* with a larger surface area provide a greater amount of cooling airflow than fluid inlets **80***b* with a smaller surface area, thus providing cooling flow distribution based on thermal load distribution. In this way, portions of the BOAS assembly **50** subject to relatively higher thermal loads compared to other portion of the BOAS assembly **50** receive greater cooling by receiving cooling airflow through relatively larger fluid inlets **80**.

[0046] In this example, each of the fluid inlets **80** is in fluid communication with a corresponding cooling passage **86** defined in the main body portion **54** radially inwards of fluid inlet **80** and cavity **70**. Each cooling passage **86** includes a first portion **86***a* generally transverse to a second portion **86***b*. The first portion **86***a* extends in a generally circumferential direction from the first circumferential end **82** to the second circumferential end **84** of the main body portion **54** to provide cooling. The second portion **86***b* extends in a generally radial direction to provide fluid communication between inlet **80** and the first portion **86***a*. In this example, each cooling passage **86** is defined entirely within the main body portion **54**.

[0047] The BOAS assembly **50** is in fluid communication with an airflow source **90** (shown schematically), such as an upstream compressor **24** or other source, such that fluid inlets **80** receive cooling airflow, such as bleed compressor air. The cooling airflow passes through fluid inlets **80** and is communicated to the first portion **86***a* of corresponding cooling passage **86** via second portion **86***b* for cooling the BOAS assembly **50**. The cooling airflow passes through the cooling passage **86** from the fluid inlet **80** to a fluid outlet **92** located at the circumferential end **82**, **84** of the cooling passage **86** opposite fluid inlet **80**. The amount of cooling airflow communicated to each cooling passage **86** is determined by the size of fluid inlet **80**. The BOAS assembly **50** also include a pressure gradient which determines the amount of cooling airflow communicated to each cooling passage **86**. In this example, the fluid inlets **80** have a cross sectional area **94** between about 0.00028 in.^2 (about 0.00181 cm^2) and about 0.0078 in.^2 (about 0.00503 cm^2). Cooling airflow is communicated through each cooling passage **86** in a single circumferential direction in this example. Plugs (not shown) are inserted to close the cooling passage **86** at the circumferential end **82**, **84** corresponding to the fluid inlet **80** of each passage.

[0048] In this example, the BOAS assembly **50** is made of a material having sulfer levels at or below 1 part per million (PPM), such as a single crystal nickel alloy, but other examples may include other types of material. The thermal barrier coating **110** is a metallic or ceramic based material in this example.

[0049] In this example, the BOAS assembly **50** includes a thermal barrier coating **110** disposed on the radially inward facing surface **64** of the main body portion **54**. The thermal barrier coating **110** includes a thermal layer **112** and a bond layer **114**. A thickness **116** of the thermal barrier coating **110** is substantially equal to a thickness **118** of an inner wall **120** of the main body portion **54** defined between a floor **122** of the plurality of cooling passages **86** and the radially inward facing surface **64**. The term substantially equal conveys that one of ordinary skill in the art would consider the measurements to be the same within recognized tolerances.

[0050] The thickness **116** of the thermal barrier coating **110** and the thickness **118** of the inner wall **120** are between 0.025 (0.0635 cm) and 0.030 inches (0.0762 cm). In this example, the thickness **116** of the thermal barrier coating **110** and the thickness **118** of the inner wall **120** is about 0.027 inches (0.0686 cm).

[0051] During gas turbine engine **20** operation, the BOAS assembly **50** is subjected to different thermal loads and environmental conditions. Cooling air flow from the airflow source **90** is provided to the various fluid inlets **80**, which communicate the cooling airflow to the cooling passages **86** to provide varying levels of cooling to different areas of the BOAS assembly **50** and effectively communicate thermal energy away from the BOAS assembly **50** and the tip of the rotating blade **51**. The thermal barrier coating **110** is provided on the radially inner facing surface **64** of the main body portion **54** to provide additional protection from the thermal loads. The at least one rib **72** provides stability to the BOAS assembly **50** to prevent axial deformation due to the reduction in BOAS assembly **50** material due to the use of cooling features and thermal bond coating, as described in this disclosure.

[0052] Referring to FIG. **6**, in another example, adjacent first portions **86***a* of cooling passages **86** provided in the main body portion **54** are connected at either the first circumferential end **82** or the second circumferential end **84** to form a serpentine passage **96** (shown schematically in phantom in FIG. **6**) in fluid communication with a single fluid inlet **80** or multiple fluid inlets **80** via one or more second portions **86***b* (as shown in FIG. **3**).

[0053] Referring to FIG. **7**, with continued reference to FIGS. **2-6**, a method of forming a BOAS assembly **200** includes providing a main body portion along an axis A having a radially inward facing surface and a radially outward facing surface that extend axially between a leading edge portion and a trailing edge portion **202**. At least one passage is disposed in the main body portion between the radially inward facing surface and the radially outward facing surface **202**. The at least one passage has a radial first portion and an axial second portion transverse to the radial first portion. The second portion defines a floor **202**. At least one rib is provided along the axis A **202**. The at least one rib is radially outward of the circumferential second portion **202**. An inner wall defined between the floor and the radially inward facing surface is machined to reduce a thickness of the inner wall **204**. A thermal barrier coating is deposited adjacent the radially inward facing surface **206**. A thickness of the thermal barrier coating is substantially equal to the reduced thickness of the inner wall **206**.

[0054] The preceding description is exemplary rather than limiting in nature. Variations and modifications to the disclosed examples may become apparent to those skilled in the art that do not necessarily depart from the essence of this disclosure. Thus, the scope of legal protection given to this disclosure can only be determined by studying the following claims.

We claim:

1. A blade outer air seal assembly for a gas turbine engine, comprising:
- a main body portion extending along an axis, the main body portion having a radially inward facing surface and at least one radially outward facing surface;
- a passage provided in the main body portion between the at least one radially inward facing surface and the at least one radially outward facing surface, the passage having a first portion and a second portion transverse to the first portion; and
- at least one rib disposed along the axis radially outward of the second portion.

2. The assembly of claim **1**, wherein the at least one rib is at least partially in a cavity that opens in a radially outward facing direction, the at least one rib comprising one of the radially outward facing surfaces.

3. The assembly of claim **1**, including at least one airflow inlet provided by one of the radially outward facing surfaces.

4. The assembly of claim **3**, wherein the at least one airflow inlet includes a first airflow inlet opening to a cavity that opens in a radially outward facing direction.

5. The assembly of claim **1**, including at least one attachment portion disposed at both a leading edge of the main body portion and a trailing edge of the main body portion, each of the at least one attachment portions having a flange extending axially aft.

6. The assembly of claim **5**, wherein the at least one rib is circumferentially aligned with one of the attachment portions disposed at the leading edge.

7. The assembly of claim **1**, wherein at least one fluid outlet is disposed at a circumferential end of the main body portion radially outward of the radially inward facing surface.

8. The assembly of claim **1**, including at least one airflow inlet provided by one of the radially outward facing surfaces, wherein the at least one airflow inlet includes at least a first airflow inlet having a cross-section greater than a second airflow inlet.

9. The assembly of claim **1**, wherein the main body portion comprises a single crystal nickel alloy having a sulfur content that is equal to or below 1 part per million.

10. The assembly of claim **1**, wherein a thermal barrier coating is disposed adjacent the radially inward facing surface, wherein a thickness of the thermal barrier coating is substantially equal to a thickness of an inner wall of the main body portion defined between a floor of the passage and the radially inward facing surface.

11. The assembly of claim **10**, wherein the passage is entirely radially outward of the thermal barrier coating.

12. The assembly of claim **1**, wherein the second portion is radially inward of the first portion.

13. The assembly of claim **1**, wherein at least one of the radially outward facing surfaces is exposed.

14. A gas turbine engine assembly, comprising:
- a plurality of blade outer air seal assemblies each configured to attach to a casing and disposed circumferentially about an engine axis, the blade outer air seal assemblies each having a main body portion with a radially inward facing surface and a radially outward facing surface, wherein at least one passage is defined in the main body portion between the radially inward facing surface and

the radially outward facing surface, the main body portion having an inner wall having a first thickness defined between a floor of each of the at least one passages and the radially inward facing surface; and

a thermal barrier coating adjacent to the radially inward facing surface, the thermal barrier coating having a second thickness that is substantially equal to the first thickness.

15. The gas turbine engine assembly of claim **14**, wherein at least one airflow inlet is opening to the radially outward facing surface, the at least one of passage generally perpendicular to the engine axis, the at least one passage in fluid communication with the at least one inlet and configured to receive cooling air flow.

16. The gas turbine engine assembly of claim **15**, wherein the at least one passage includes a first passage in fluid communication with a first airflow inlet of the at least one airflow inlet having airflow greater than a second passage in fluid communication with a second airflow inlet.

17. The gas turbine engine assembly of claim **16**, wherein the first airflow inlet has a cross-section greater than the second airflow inlet.

18. The gas turbine engine assembly of claim **15**, wherein an airflow source communicates compressor bleed air to the at least one inlet.

19. The gas turbine engine assembly of claim **14**, wherein each of the plurality of blade outer air seal assemblies includes at least one attachment portion disposed at each of a leading edge of the main body portion and a trailing edge of the main body portion, each of the at least one attachment portions having a flange extending axially aft, each of the at least one attachment portions aligned with corresponding receiving portion of the casing to attach the plurality of blade outer air seal assemblies to the casing.

20. The gas turbine engine assembly of claim **14**, including at least at least one rib is disposed along the engine axis radially outward of the second portion.

21. A method of forming a blade outer air seal for a gas turbine engine comprising:

providing a main body portion having a radially inward facing surface and a radially outward facing surface that axially extend along an axis, wherein at least one passage is defined in the main body portion between the radially inward facing surface and the radially outward facing surface, the at least one passage having a first portion extending generally radially and a second portion extending generally circumferentially transverse to the first portion, wherein the second portion has a floor, wherein at least one rib is disposed along the axis on the radially outward facing surface, the at least one rib radially outward of the circumferential second portion;

machining an inner wall defined between the floor and the radially inward facing surface to reduce a thickness of the inner wall; and

depositing a thermal barrier coating adjacent the radially inward facing surface, wherein the thermal barrier coating is substantially equal to the reduced thickness of the inner wall.

22. The method of claim **21**, including the step of forming at least one airflow inlet opening to the radially outward facing surface, wherein the at least one passage is in fluid communication with the at least one inlet and configured to receive cooling air flow.

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