A locking spacer assembly for securing adjacent rotor blades includes a first end piece configured to fit into a space between the platforms of adjacent rotor blades. The first end piece comprises an outer surface and an inner surface. The outer surface has a profile that is adapted to project into the attachment slot. A second end piece is configured to fit into a space between the platforms. The second end piece comprises an outer surface and an inner surface. The outer surface has a profile that is adapted to project into the attachment slot. The inner surfaces of the first and second end pieces generally face each other. The first end piece and the second end piece are bonded together either directly or via a spacer block that is inserted between the inner surfaces.
LOCKING SPACER ASSEMBLY

FIELD OF THE INVENTION

[0001] The present invention generally involves a turbomachine. More specifically, the invention relates to locking spacer assemblies for securing rotor blades to a rotor disk of the turbomachine.

BACKGROUND OF THE INVENTION

[0002] Various turbomachines such as a gas turbine or steam turbine include a shaft, multiple rotor disks coupled to the shaft and various rotor blades mounted to the rotor disks. A conventional gas turbine includes a rotatable shaft with various rotor blades mounted to discs in the compressor and turbine sections thereof. Each rotor blade includes an airfoil over which pressurized air, combustion gases or other fluids such as steam flows, and a platform at the base of the airfoil that defines a radially inner boundary for the air or fluid flow.

[0003] The rotor blades are typically removable, and therefore include a suitable root portion such as a T-type root portion that is configured to engage a complementary attachment slot in the perimeter of the rotor disk. The root may either be an axial-entry root or a circumferential-entry root that engages with corresponding axial or circumferential slots formed in the disk perimeter. A typical root includes a neck of minimum cross sectional area and root protrusions that extend from the root into a pair of lateral recesses located within the attachment slot.

[0004] For circumferential roots, a single attachment slot is formed between forward and aft continuous circumferential posts or hoops that extend circumferentially around the entire perimeter of forward and aft faces of the rotor disk. The cross-sectional shape of the circumferential attachment slot includes lateral recesses defined by the forward and aft rotor disk posts or hoops that cooperate with the root protrusions of the rotor blades to radially retain the individual blades during turbine operation.

[0005] In the compressor section of a gas turbine, for example, rotor or compressor blades (specifically the root components) are inserted into and around the circumferential slot and rotated approximately ninety degrees to bring the root protrusions of the rotor blades into contact with the lateral recesses to define a complete stage of rotor blades around the circumference of the rotor disks. The rotor blades include platforms at the airfoil base that may be in abutting engagement around the slot. In other embodiments, spacers may be installed in the circumferential slot between adjacent rotor blade platforms. Once all of the blades (and spacers) have been installed, a final remaining space or spaces in the attachment slot is typically filled with a specifically designed spacer assembly, as generally known in the art.

[0006] A common technique used to facilitate the insertion of the final spacer assembly into the circumferential slot is to include a non-axi symmetric loading slot in the rotor disc. Various conventional spacer assemblies have been designed to eliminate the need for a loading slot in the rotor disk. However, these assemblies include complex devices. These conventional assemblies are generally difficult to assemble, costly to manufacture and may result in rotor imbalance. Accordingly, there is a need for an improved locking spacer assembly that is relatively easy to assemble within the final space between platforms of adjacent rotor blades of a turbomachine such as compressor and/or turbine rotor blades of a gas turbine.

BRIEF DESCRIPTION OF THE INVENTION

[0007] Aspects and advantages of the invention are set forth below in the following description, or may be obvious from the description, or may be learned through practice of the invention.

[0008] One embodiment of the present invention is a locking spacer assembly for insertion into a circumferential attachment slot between platforms of adjacent rotor blades. The locking spacer assembly includes a first end piece configured to fit into a space between the platforms and an outer extending root. The first end piece comprises an outer surface and an inner surface. The outer surface has a profile that is adapted to project into the attachment slot. A second end piece is configured to fit into a space between the platforms. The second end piece comprises an outer surface and an inner surface. The outer surface has a profile that is adapted to project into the attachment slot. The inner surfaces of the first and second end pieces generally face each other. A spacer block is configured to be inserted between the inner surfaces of the first and second end pieces. The spacer block is bonded to each of the first end piece and the second end piece.

[0009] Another embodiment of the present invention is a locking spacer assembly for insertion into a circumferential attachment slot between platforms of adjacent rotor blades. The locking spacer assembly includes a first end piece configured to fit into a space between the platforms of adjacent rotor blades. The first end piece comprises an outer surface and an inner surface. The outer surface has a profile that is adapted to project into the attachment slot. A second end piece is configured to fit into a space between the platforms. The second end piece comprises an outer surface and an inner surface. The outer surface has a profile that is adapted to project into the attachment slot. The inner surfaces of the first and second end pieces generally face each other. The first end piece is bonded to the second end piece along a joint defined between the inner surfaces.

[0010] Another embodiment of the present invention is a turbomachine. The turbomachine includes a compressor, a combustor and a turbine. At least one of the compressor or the turbine comprises a rotor disk having forward and aft posts. The forward and aft posts at least partially define a continuous circumferentially extending attachment slot. The turbomachine further includes a plurality of rotor blades. Each of the rotor blades extends from a corresponding one platform of a plurality of platforms. Each of the plurality of platforms is secured to the attachment slot by an outer extending root. A locking spacer assembly is disposed in a space between at least two of the plurality of platforms. The locking spacer assembly comprises a first end piece that is configured to fit into a space between the platforms of the adjacent rotor blades. The first end piece comprises an outer surface and an inner surface. The outer surface has a profile that is adapted to project into the attachment slot. A second end piece is configured to fit into a space between the platforms. The second end piece comprises an outer surface and an inner surface. The outer surface has a profile that is adapted to project into the attachment slot. The inner surfaces of the first and second end pieces generally face each other. The first end piece is bonded to the second end piece.
Those of ordinary skill in the art will better appreciate the features and aspects of such embodiments, and others, upon review of the specification.

BRIEF DESCRIPTION OF THE DRAWINGS

A full and enabling disclosure of the present invention, including the best mode thereof to one skilled in the art, is set forth more particularly in the remainder of the specification, including reference to the accompanying figures, in which:

FIG. 1 is a functional diagram of an exemplary gas turbine within the scope of the present invention;

FIG. 2 is a partial sectional view of an embodiment of a root and attachment slot configuration for circumferential entry rotor blades;

FIG. 3 is a partial perspective view of an exemplary rotor disk including fluid or load-in spaces into which a locking spacer assembly may be inserted;

FIG. 4 is a top view of a portion of the rotor disk as shown in FIG. 3, according to one embodiment of the present invention;

FIG. 5 is a [an] exploded view of the components of an embodiment of the locking spacer assembly in accordance with various aspects of the present invention;

FIG. 6, FIG. 7, FIG. 8 and FIG. 9 are sequential assembly views of a locking spacer assembly according to one embodiment of the present invention;

FIG. 10 provides a cross section side view of a portion of a rotor disk including an alternate embodiment of a locking spacer assembly according to one embodiment of the present invention; and

FIG. 11 is a top view of a portion of a rotor disk including the locking spacer assembly as shown in FIG. 10.

DETAILED DESCRIPTION OF THE INVENTION

Reference will now be made in detail to present embodiments of the invention, one or more examples of which are illustrated in the accompanying drawings. The detailed description uses numerical and letter designations to refer to features in the drawings. Like or similar designations in the drawings and description have been used to refer to like or similar parts of the invention. As used herein, the terms “first”, “second”, and “third” may be used interchangeably to distinguish one component from another and are not intended to signify location or importance of the individual components.

As used herein, the terms “upstream” and “downstream” refer to the relative direction with respect to fluid flows in a fluid pathway. For example, “upstream” refers to the direction from which the fluid flows, and “downstream” refers to the direction to which the fluid flows. The term “radially” refers to the relative direction in a plane that is substantially perpendicular to an axial centerline of a particular component, and the term “axially” refers to the relative direction in a plane that is substantially parallel to an axial centerline of a particular component.

Each example is provided by way of explanation of the invention, not limitation of the invention. In fact, it will be apparent to those skilled in the art that modifications and variations can be made in the present invention without departing from the scope or spirit thereof. For instance, features illustrated or described as part of one embodiment may be used on another embodiment to yield a still further embodiment. Thus, it is intended that the present invention covers such modifications and variations as come within the scope of the appended claims and their equivalents.

Although exemplary embodiments of the present invention will be described generally in the context of a gas turbine for purposes of illustration, one of ordinary skill in the art will readily appreciate that embodiments of the present invention may be applied to any turbomachine having a shaft and rotating blades coupled to the shaft such as a steam turbine or the like, and are not limited to a gas turbine unless specifically recited in the claims.

Referring now to the drawings, wherein identical numerals indicate the same elements throughout the figures, FIG. 1 provides a functional diagram of one embodiment of a turbomachine, in this case an exemplary gas turbine 10 which may incorporate various embodiments of the present invention. It should be understood that the present disclosure is not limited to gas turbines, and rather that steam turbines or any other suitable turbomachines are within the scope and spirit of the present disclosure. As shown, the gas turbine 10 generally includes a compressor section 12 including a compressor rotor 14 disposed at an upstream end of the gas turbine 10; a combustor section 16 having at least one combustor 18 downstream from the compressor 14, and a turbine section 20 including a turbine 22 that is downstream from the combustor section 14. A shaft 24 extends along an axial centerline 26 of the gas turbine 10 at least partially through the compressor 14 and/or the turbine 22. In particular configurations, the shaft 24 may comprise of a plurality of individual shafts.

Multiple rotor wheels or disks 28 are disposed coaxially along the shaft 24 within the compressor 14 and/or the turbine 22. Each rotor disk 28 is configured to receive a plurality of radially extending rotor blades 30 that are circumferentially spaced around and removably fixed to the rotor disk 28. The rotor blades 30 may be configured for use within the compressor 14 such as a compressor rotor blade 32 or for use within the turbine 22 such as a turbine bucket or turbine rotor blade 34. Each blade 30 has a longitudinal centerline axis 36 and includes an airfoil portion 38 having a leading edge 40 and a trailing edge 42.

In operation, a working fluid 44 such as air is routed into the compressor 14 where it is progressively compressed in part by the compressor rotor blades 32 as it is routed towards the combustor section 16. A compressed working fluid 46 flows from the compressor 14 and is supplied to the combustor section 16. The compressed working fluid 46 is distributed to each of the combustors 18 where it is mixed with a fuel to provide a combustible mixture. The combustible mixture is burned to produce combustion gases 48 at a relatively high temperature and high velocity. The combustion gases 48 are routed through the turbine 22 where thermal and kinetic energy is transferred to the turbine rotor blades 34, thereby causing the shaft 24 to rotate. In particular applications, the shaft 24 is coupled to a generator (not shown) to produce electricity.
platform 50. The root portion 52 slides into and along a circumferentially extending attachment slot 54 at least partially defined by forward and aft hoop or post components 56 of the rotor disk 28, as is generally known in the art. In the alternative, the circumferentially extending attachment slot 54 may be machined, cast or otherwise defined by the rotor disk 28.

[0029] The root portion 52 may include protrusions 58 that are received into lateral recesses 60 defined within the attachment slot 54 and at least partially defined by recessed wall portions 62 of the post components 56. The forward and aft post components 56 and/or the rotor disk 28 may further define sidewall portions 64 of the attachment slot 54. It should be readily appreciated that the configuration of the root portion 52 and attachment slot 54 provided in FIG. 2 is for illustrative purposes only, and that the root and slot configuration may vary widely within the scope and spirit of the present subject matter.

[0030] FIG. 3 is a partial perspective view of a portion of an exemplary rotor disk 28, and particularly illustrates a plurality of the rotor blades 30 configured in an attachment slot 54 (FIG. 2) between the forward and aft post components 56 of the rotor disk 28. As shown in FIGS. 2 and 3, each of the rotor blades 30 includes a platform 50. As shown in FIG. 3, conventional spacers 66 are disposed between the platforms 50 of adjacent rotor blades 30, as is generally known in the art.

[0031] FIG. 4 is a top view of a portion of the rotor disk 28 as shown in FIG. 3, according to one embodiment of the present invention. As shown in FIG. 3, one or more final or load-in spaces 68, having a circumferential width 70, are defined between adjacent rotor blade 30 platforms 50. The final or load-in spaces 68 are generally used to insert the rotor blades 30 into the attachment slot 54 during assembly and/or disassembly of the rotor blades 30 to the rotor disk 28. In particular embodiments, as shown in FIG. 4, the final or load-in spaces 68 can be filled by various embodiments of a locking spacer assembly 100 which is described in greater detail below.

[0032] It should be appreciated that in particular embodiments, the locking spacer assembly 100 can be used to fill final spaces 68 between platforms 50 of adjacent rotor blades 30 including the compressor rotor blades 32 located within the compressor 14 and/or the turbine rotor blades 34 located within the turbine 22. As such, the locking spacer assembly 100 will be generally described below as being installed between platforms 50 of adjacent rotor blades 30, wherein the platforms 50 may be part of a compressor rotor blade 32 or a turbine rotor blade 34 so as to fully encompass both applications.

[0033] FIG. 5 is an exploded view of the components of a locking spacer assembly 100 herein referred to as “assembly 100” according to one embodiment of the present invention. As shown in FIG. 5, the assembly 100 includes a first end piece 102, a second end piece 104 and a spacer block 106. The first and second end pieces 102, 104 are configured to fit into the final spaces 66 between the platforms 50 of adjacent rotor blades 30. The end pieces 102, 104, thus, have any dimensional configuration such that the width, length, thickness, or any other characteristics enables the end pieces 102, 104 to be inserted between the platforms 50. For example, the end pieces 102, 104 may generally have a circumferential width 108 (FIG. 4) in order to fit snugly between the platforms 50 of adjacent rotor blades 30.

[0034] As shown in FIG. 5, the first end piece 102 comprises a platform portion 110 and a root portion 112. The platform portion 110 generally has a radial height 114, an axial length 116 and a circumferential width 118. The root portion 112 extends radially inwardly from the platform portion 110. The platform portion 110 and the root portion 112 define a first inner surface 120 and an outer surface 122. In one embodiment, the first inner surface 120 is substantially perpendicular to an axial plane and/or axial centerline extending through the locker spacer assembly 100 and/or the first end piece 102. In alternate embodiments, the first inner surface 120 may be angled with respect to a radially extending plane that is perpendicular to the axial plane and/or axial centerline. In another embodiment, the first inner surface 120 is configured to mate with a side surface 124 of the spacer block 106. For example, the first inner surface 120 and the side surface 124 may be shaped and/or angled congruently.

[0035] The outer surface 122 has a profile that is defined along the root portion 112. The profile is adapted to project into a first lateral recess 126 of the attachment slot 54. For example, the profile may include a first projection 128. The first projection 128 may be shaped to project into the first lateral recess 126. The outer surface 122 may be curved or otherwise shaped so as to mirror the curve of the post components 56. It should be readily appreciated that the first projection 128 can have any desired profile and need not have the particular profile illustrated in FIG. 5. The profile of the first projection 128 will depend in large part on the particular shape and configuration of the attachment slot 54.

[0036] In particular embodiments, an arcuate groove 130 or other stress relief feature such as a blend or fillet is defined by the first end piece 102 proximate to a location where the first projection 128 is defined or extends generally axially outwardly from the root portion 112 of the first end piece 102. The arcuate groove 130 may be included to provide a point of low stress or a location for stress relief on the first end piece 102. As later illustrated, the arcuate groove 130 may be located on the root portion 112 at a corner formed between the forward or aft post component 56 and the first lateral recess 126.

[0037] As shown in FIG. 5, a recess 132 may be formed on the platform portion 110 of the first end piece 102. The recess 132 may be positioned generally adjacent to the first inner surface 120. The recess 132 may be configured or shaped to receive a complimentary collar or protrusion 134 formed on and/or adjacent to the side surface 124 of the spacer block 106. For example, the recess 132 and the collar 134 may be rectangular, trapezoidal, arcuate or any shape so as to create an interlocking action between the first end piece 102 and the spacer block 106.

[0038] As shown in FIG. 5, the second end piece 104 comprises a platform portion 136 and a root portion 138. The platform portion 136 generally has a radial height 140, an axial length 142 and a circumferential width 144. The root portion 138 extends radially inwardly from the platform portion 136. The platform portion 136 and the root portion 138 define a second inner surface 146 and an outer surface 148. In one embodiment, the second inner surface 146 is substantially perpendicular to an axial plane and/or axial centerline extending through the locker spacer assembly 100 and/or the second end piece 104. In alternate embodiments, the second inner surface 146 is angled with respect to a radially extending plane that is perpendicular to the axial plane and/or axial centerline. In one embodiment, the second inner surface 146
is configured to mate with a side surface 159 of the spacer block 106. For example, the second inner surface 146 and the side surface 150 may be shaped and/or angled congruently.  

[0039] The outer surface 148 has a profile that is defined along the root portion 138. The profile of the outer surface 148 is adapted to project into a second lateral recess 152 of the attachment slot 54. For example, the profile may include a second projection 154. The second projection 154 may be shaped to project into the second lateral recess 152. The outer surface 148 may be curved or otherwise shaped so as to mirror the curve of the post components 56. It should be readily appreciated that the second projection 154 can have any desired profile and need not have the particular profile illustrated in FIG. 5. The profile of the second projection 154 will depend in large part on the particular shape and configuration of the attachment slot 54.  

[0040] In particular embodiments, an arcuate groove 156 or other stress relief feature such as a blend or fillet is defined by the second end piece 104 proximate to a location where the second projection 154 is defined or extends generally axially outwardly from the root portion 138 of the second end piece 104. The arcuate groove 156 may be located near the point of low stress or a location for stress relief on the second end piece 104. As later illustrated, the arcuate groove 156 may be located on the root portion 138 at a corner formed between the forward or aft post component 56 and the second lateral recess 152.  

[0041] As shown in FIG. 5, a recess 158 may be formed on the platform portion 136 of the second end piece 104. The recess 158 may be positioned generally adjacent to the second inner surface 146. The recess 158 may be configured or shaped to receive a complimentary collar or protrusion 160 formed on and/or adjacent to the side surface 150 of the spacer block 106. For example, the recess 158 and the collar 160 may be rectangular, trapezoidal and arcuate or any shape so as to create an interlocking action between the second end piece 104 and the spacer block 106.  

[0042] In particular embodiments, as shown in FIG. 4, the spacer block 106 is also configured to fit between the platforms 50 of adjacent rotor blades 30. For example, as shown in FIG. 5, the spacer block 106 may generally have a circumferential width 162 in order to fit snugly between the platforms 50 (FIG. 4). Although illustrated as generally rectangular, the spacer block 106 may be staggered, Z-shaped, arcuate or may have any dimensional configuration such that the width, length, thickness, or any other characteristic enables the spacer block 106 to be inserted between the first and second inner surfaces 120, 146 of the first and second end pieces 102, 104. In the illustrated embodiment, the first inner surface 120 generally faces towards side wall 124 and the second inner surface 146 faces towards side wall 150 when the end pieces 102, 104 and the spacer block 106 are inserted into the attachment slot 54, as is generally illustrated in FIG. 4. The spacer block 106 generally includes a platform portion 164.  

[0043] FIG. 6, FIG. 7, FIG. 8 and FIG. 9 are sequential assembly views of a locking spacer assembly 100 according to one embodiment of the present invention. As shown in FIG. 6, the root portion 138 of the second end piece 104 is lowered into the attachment slot 54 between the opposing sidewall portions 64. As shown in FIG. 7, the second projection 154 is positioned such that it extends within the second lateral recess 152. As shown in FIG. 7, the root portion 112 of first end piece 102 is lowered into the attachment slot 54 adjacent to the second end piece 104 such that the first inner surface 120 and the second inner surface 146 face one another. As shown in FIG. 8, the first projection 128 is then positioned such that it extends into the first lateral recess 126. The assembly sequence of the first end piece 102 and the second end piece 104 may be reversed.  

[0044] As further shown in FIGS. 8 and 9, the spacer block 106 is then inserted between the first and second inner surfaces 120, 146. The spacer block 106 may be temporarily held in position by a press fit between the first and second inner surfaces of the first and second end pieces 102, 104 and/or may be held in position by the collars 134, 160. In addition or in the alternative, as shown in FIG. 9, the spacer block 106 may extend radially inwardly so as to engage with a bottom wall portion 166 of the attachment slot 54. The spacer block 106 may then be bonded into position along at least one interface or connection joint 168 defined along at least one of the intersections of the first and second inner surfaces 120, 146 and the side surfaces 124, 150, thereby locking the locking spacer assembly 100 into position and securing the adjacent rotor blades 30 to the rotor disk 28. In particular embodiments, the spacer block 106 may be bonded by welding, brazing, adhesive cladding or by any suitable bonding method known in the art for bonding metal components that is suitable for the operational environment of the rotor blades 30.  

[0045] FIG. 10 provides a cross section side view of a portion of a rotor disk 28 including an alternate embodiment of the locking spacer assembly 100 according to one embodiment of the present invention. FIG. 11 is a top view of a portion of a rotor disk 28 including the locking spacer assembly 100 as shown in FIG. 10. In an alternate embodiment, as shown in FIG. 10, the locking spacer assembly 100 include the first end piece 102 and the second end piece 104 configured as previously described herein. As shown, the inner surface 120 of the first end piece 102 and the inner surface 146 of the second end piece 104 are adjacent when installed into the attachment slot 54. An interface or connection joint 170 is defined between the inner surface 120 of the first end piece 102 and the inner surface 146 of the second end piece 104. The first end piece 102 and second end piece 104 are bonded along the connection joint 170. In particular embodiments, the first end piece 102 and second end piece 104 are bonded by at least one of welding, brazing, adhesive cladding or by any suitable bonding method known in the art for bonding metal components that is suitable for the operational environment of the rotor blades 30. In this embodiment, a recess 172 may be formed on either one of the first or second end pieces 102, 104 and a protrusion or collar 174 may be formed on the other of the first or second end pieces 102, 104, thus holding the assembly in position during installation. The platform portion 110 of the first end piece 102 and the platform portion 136 of the second end piece 104 define a platform portion of the locking spacer assembly 100 and the connection joint extends along the platform portion of the locking spacer assembly 100.  

[0046] In this configuration, one of the first or second end pieces 102, 104 are inserted into the attachment slot 54 and the other of the first or second end pieces 102, 104 is angled into the attachment slot 54 such that the first and second inner surfaces 120, 146 are adjacent. The first and second end pieces 102, 104 are then bonded together along the connection joint 170, thereby locking the locking spacer assembly 100 into position and securing the adjacent rotor blades 30 to the rotor disk 28.
This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they include structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal language of the claims.

What is claimed is:

1. A locking spacer assembly for insertion into a circumferential attachment slot between platforms of adjacent rotor blades, comprising:
   a first end piece configured to fit into a space between platforms of adjacent rotor blades, said first end piece comprising an outer surface and an inner surface, said outer surface having a profile adapted to project into an attachment slot; and
   a second end piece configured to fit into said space between said platforms, said second end piece comprising an outer surface and an inner surface, said outer surface having a profile adapted to project into said attachment slot, wherein said inner surfaces of said first and second end pieces generally face each other; and
   a spacer block configured to be inserted between said inner surfaces of said first and second end pieces, wherein said spacer block is bonded to each of said first end piece and said second end piece.

2. The locking spacer assembly as in claim 1, further comprising connection joints defined between said first end piece and said spacer block and said second end piece and said spacer block, wherein said spacer block is bonded along at least one of said connection joints.

3. The locking spacer assembly as in claim 1, wherein said spacer block is bonded via at least one of welding or brazing.

4. The locking spacer assembly as in claim 1, wherein said spacer block is bonded via adhesive cladding.

5. The locking spacer assembly as in claim 1, wherein each of said first end piece, said second end piece and said spacer block defines a platform portion of the locking spacer assembly.

6. The locking spacer assembly as in claim 5, wherein each of said first end piece, said second end piece and said spacer block are bonded along said platform portion.

7. The locking spacer assembly as in claim 1, wherein said spacer block engages with a bottom portion of said attachment slot.

8. The locking spacer assembly as in claim 1, further comprising recesses formed on said inner surfaces of said first and second end pieces and collars formed on said spacer block, wherein said collars are configured to be received in said recesses when said spacer block is inserted between said inner surfaces.

9. A locking spacer assembly for insertion into a circumferential attachment slot between platforms of adjacent rotor blades, comprising:
   a first end piece configured to fit into a space between platforms of adjacent rotor blades, said first end piece comprising an outer surface and an inner surface, said outer surface having a profile adapted to project into an attachment slot; and
   a second end piece configured to fit into a space between said platforms, said second end piece comprising an outer surface and an inner surface, said outer surface having a profile adapted to project into said attachment slot, wherein said inner surfaces of said first and second end pieces are adjacent to each other; and
   wherein said first end piece is bonded to said second end piece along a joint defined between said inner surfaces.

10. The locking spacer assembly as in claim 9, wherein said first end piece and said second end piece are bonded via welding.

11. The locking spacer assembly as in claim 9, wherein said first end piece and said second end piece are bonded via brazing.

12. The locking spacer assembly as in claim 9, wherein each of said first end piece and said second end piece define a platform portion of the locking spacer assembly.

13. The locking spacer assembly as in claim 12, wherein said joint extends along said platform portion.

14. The locking spacer assembly as in claim 9, further comprising a recess formed on said inner surface of said first end piece and a collar formed on said inner surface of said second end piece, wherein said collar is configured to be received in said recess when said first and second end pieces are installed into said attachment slot.

15. A turbomachine, comprising:
   a compressor;
   a combustor;
   a turbine; and
   wherein at least one of the compressor or the turbine comprises:
   a rotor disk comprising forward aft posts defining a continuous circumferentially extending attachment slot;
   a plurality of rotor blades, each of the plurality of rotor blades extending from one of a plurality of platforms, wherein each of the plurality of platforms is secured to the attachment slot by an inwardly extending root; and
   a locking spacer assembly disposed in a space between at least two of the plurality of platforms, the locking spacer assembly comprising:
   a first end piece configured to fit into a space between platforms of adjacent rotor blades, said first end piece comprising an outer surface and an inner surface, said outer surface having a profile adapted to project into an attachment slot; and
   a second end piece configured to fit into a space between said platforms, said second end piece comprising an outer surface and an inner surface, said outer surface having a profile adapted to project into said attachment slot, wherein said inner surfaces of said first and second end pieces generally face each other; and
   wherein said first end piece is bonded to said second end piece.

16. The turbomachine as in claim 15, wherein said first end piece is bonded to said second end piece along a joint defined between said inner surfaces.

17. The turbomachine as in claim 15, where said first end piece is bonded to said second end piece via at least one of welding or brazing.

18. The turbomachine as in claim 15, wherein said first end piece and said second end piece define a platform portion of
the locking spacer assembly, wherein said first end piece and said second end piece are bonded along said platform portion.

19. The turbomachine as in claim 15, further comprising a spacer block configured to be inserted between said inner surfaces of said first and second end pieces, wherein said first end piece is bonded to said second end piece via said spacer block.

20. The turbomachine as in claim 19, wherein said first end piece, said second end piece and said spacer block define a platform portion of the locking spacer assembly, wherein each of said first end piece, said second end piece and said spacer block are bonded along said platform portion.