mechanical or thermal load cycles and improving the tri-axial pressure integrity of the tubular connection.

[0028] In a further aspect, a tubular connection includes a pin member and a box member. The pin member has a tapered, constant pitch thread having a root, a crest, a stab flank and a load flank. The stab flank of the pin member thread has a base surface and a second surface, the base surface extending radially outward and away from the root at a base angle relative to radial, the second surface extending radially outward and away from the end of the base surface at a second angle relative to radial, the second angle greater than the base angle. The box member has a tapered, constant pitch thread having a root, a crest, a stab flank and a load flank, the stab flank of the box member thread having a base surface and a second surface, the base surface extending radially inward and away from the root at a base angle relative to radial, the second surface extending radially inward and away from the end of the base surface at a second angle relative to radial, the second angle greater than the base angle. The stab flank of the pin member thread interacts with the stab flank of the box member thread during connection make-up to move the load flank of the pin member thread into substantive contact with the load flank of the box member thread.

[0029] In the tubular connection of the preceding paragraph, the stab flank of the pin member thread and the stab flank of the box member thread are configured to interact during connection make-up such that the load flank of the pin member thread moves into substantive contact with the load flank of the box member thread before the pin member thread and the box member thread reach sixty percent of radial make-up engagement depth.

[0029a] In yet a further aspect, a tubular connection includes a pin member and a box member. The pin member has a tapered thread with a root, a crest, a stab flank and a load flank. The stab flank of the pin member thread has a base surface and a second surface, the base surface extending radially outward and away from the root at a base angle relative to radial, the second surface extending radically outward and away from the end of the base surface at a second angle relative to radial, the second angle greater than the base angle. The box member has a tapered thread with a root, a crest, a stab flank and a load flank. The stab flank of the box member thread has a base surface and a second surface, the base surface extending radially inward and away from the root at a base angle relative to radial, the second surface extending radically inward and away from the end of the base surface at a second

angle relative to radial, the second angle greater than the base angle. A thread profile is defined by the root, a crest, a stab flank and a load flank of at least one of the pin member or the box member, and an imaginary line that intersects the stab flank and the load flank of the thread profile such that the axial width of the thread ridge equals the axial width of the thread groove is a stepped line.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] Fig. 1 is a schematic view of an exemplary prior art thread form having a positive stab flank angle and a positive load flank angle;

[0031] Figs. 2 and 3 are schematic views of one embodiment of a thread form of the present invention;

[0032] Figs. 4 to 7 depict thread interaction during the make-up sequence of members incorporating the thread from of Figs. 2 and 3;

[0033] Fig. 8 is an enlarged view of stab flank substantive contact in an exemplary fully made up connection; and

[0034] Figs. 9 and 10 depict exemplary connection configurations into which the subject thread form can be incorporated.

AMENDED CLAIMS
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1. A tubular connection, comprising:

a pin member having a tapered, constant pitch thread having a root, a crest, a stab flank and a load flank, the stab flank of the pin member thread having a base surface and a second surface, the base surface extending radially outward and away from the root at a base angle relative to radial, the second surface extending radially outward and away from the end of the base surface at a second angle relative to radial, the second angle greater than the base angle; and

a box member having a tapered, constant pitch thread having a root, a crest, a stab flank and a load flank, the stab flank of the box member thread having a base surface and a second surface, the base surface extending radially inward and away from the root at a base angle relative to radial, the second surface extending radially inward and away from the end of the base surface at a second angle relative to radial, the second angle greater than the base angle;

wherein a profile defined by the root, crest, stab flank and load flank of at least one of the pin member or the box member results in a pitch line of the pin member or box member that is a stepped pitch line.

2. The connection of claim 1, wherein a first cycle of the stepped pitch line is defined by a first line segment passing through a first thread ridge segment of the profile and a second line segment passing through a first thread groove segment of the profile, the second line segment angularly offset from the first line segment such that the first line segment is not parallel to the second line segment.

3. The connection of claim 2, where a second cycle of the stepped pitch line is defined by a first line segment through a second thread ridge segment of the profile and a second line segment through a second thread groove segment of the profile, the first thread groove segment bounded by the first thread ridge segment and the second thread ridge segment, the second thread groove segment adjacent the second thread ridge segment, wherein the first line segment of the second thread ridge segment runs parallel to, but offset radially from the first line segment of the first thread ridge segment, wherein the second line segment of the second thread groove segment runs parallel to, but radially offset from the second line segment of the first thread groove segment.

4. The connection of claim 2 wherein:

a thread taper associated with the one of the box member or the pin member is angularly offset from both the first line segment and the second line segment.

5. The connection of claim 2 wherein the second line segment is offset from a central longitudinal axis of the pin member or box member by an angle that is greater than any angle of offset that may exist between the first line segment and the central longitudinal axis.

6. The connection of claim 1 wherein each of the pitch line of the pin member and the pitch line of the box member is a stepped pitch line.

7. The connection of claim 6 wherein:

the pitch line of the pin member intersects the stab flank at a pin thread intersecting location radially outward of a mid-point of the height of the stab flank of the pin member thread, the base surface of the stab flank of the pin member thread extends outward to the pin thread intersecting location;

the pitch line of the box member intersects the stab flank at a box thread intersecting location radially inward of a mid-point of the height of the stab flank of the box member thread, the base surface of the stab flank of the box member thread extends inward to the box thread intersecting location.

8. The connection of claim 7 wherein:

when the connection is fully made up, the stab flank of the pin member thread and the stab flank of the box member thread are in substantive contact over a radial band.

9. The connection of claim 8 wherein the radial band of substantive contact extends a radial distance that is equal to or greater than at least seventeen percent of stab flank height.

10. The connection of claim 9 wherein:

when the connection is fully made up, the mid-point of the stab flank height of

the pin member substantially aligns with the mid-point of the stab-flank height of the box member, and the radial band of substantive contact extends both radially outward of and radially inward of the substantially aligned mid-points.

11. The connection of claim 1 wherein:

the stab flank of the pin member thread interacts with the stab flank of the box member thread during connection make-up to move the load flank of the pin member thread into substantive contact with the load flank of the box member thread.

12. The connection of claim 11 wherein the stab flank of the pin member thread and the stab flank of the box member thread are configured to interact during connection make-up such that the load flank of the pin member thread moves into substantive contact with the load flank of the box member thread before the pin member thread and the box member thread reach sixty-five percent of radial make-up engagement depth.

13. A threaded tubular member, comprising:

an elongated body having an axial passage therethrough, an end portion of the body having a tapered, constant pitch thread having a root, a crest, a stab flank and a load flank, the stab flank having a base surface and a second surface, the base surface extending radially outward and away from the root at a base angle relative to radial, the second surface extending radially outward and away from the end of the base surface at a second angle relative to radial, the second angle greater than the base angle, wherein a profile defined by the root, crest, stab flank and load flank of at least one of the pin member or the box member results in a pitch line of the pin member or box member that is a stepped pitch line.

14. The tubular member of claim 13, wherein a first cycle of the stepped pitch line is defined by a first line segment passing through a first thread ridge segment of the profile and a second line segment passing through a first thread groove segment of the profile, the second line segment angularly offset from the first line segment such that the first line segment is not parallel to the second line segment.

15. The tubular member of claim 14 wherein a thread taper defined by the profile is angularly offset from both the first line segment and the second line segment.

16. A connection, comprising:

a pin member having a tapered, constant pitch thread having a root, a crest, a stab flank and a load flank, the stab flank of the pin member thread having a base surface and a second surface, the base surface extending radially outward and away from the root at a base angle relative to radial, the second surface extending radially outward and away from the end of the base surface at a second angle relative to radial, the second angle greater than the base angle; and

a box member having a tapered, constant pitch thread having a root, a crest, a stab flank and a load flank, the stab flank of the box member thread having a base surface and a second surface, the base surface extending radially inward and away from the root at a base angle relative to radial, the second surface extending radially inward and away from the end of the base surface at a second angle relative to radial, the second angle greater than the base angle;

wherein when the connection is fully made up, the stab flank of the pin member thread and the stab flank of the box member thread are in substantive contact over a wide radial band.

17. The connection of claim 16 wherein the wide radial band of contact extends a radial distance that is equal to or greater than at least twenty percent of stab flank height.

18. The connection of claim 17 wherein:

when the connection is fully made up, the mid-point of the stab flank height of the pin member substantially aligns with the mid-point of the stab-flank height of the box member, and the wide radial band of contact extends both radially outward of and radially inward of the substantially aligned mid-points.

19. A connection, comprising:

a pin member having a tapered, constant pitch thread having a root, a crest, a stab flank and a load flank, the stab flank of the pin member thread having a base surface and a second surface, the base surface extending radially outward and away from the root at a base angle relative to radial, the second surface extending radially outward and away from the end of the base surface at a second angle relative to radial, the second angle greater than the base angle; and

a box member having a tapered, constant pitch thread having a root, a crest, a stab flank and a load flank, the stab flank of the box member thread having a base surface and a second surface, the base surface extending radially inward and away from the root at a base angle relative to radial, the second surface extending radially inward and away from the end of the base surface at a second angle relative to radial, the second angle greater than the base angle;

wherein the stab flank of the pin member thread interacts with the stab flank of the box member thread during connection make-up to move the load flank of the pin member thread into substantive contact with the load flank of the box member thread.

20. The connection of claim 19 wherein the stab flank of the pin member thread and the stab flank of the box member thread are configured to interact during connection make-up such that the load flank of the pin member thread moves into substantive contact with the load flank of the box member thread before the pin member thread and the box member thread reach sixty-five percent of radial make-up engagement depth.

21. A tubular connection, comprising:

a pin member having a tapered thread with a root, a crest, a stab flank and a load flank, the stab flank of the pin member thread having a base surface and a second surface, the base surface extending radially outward and away from the root at a base angle relative to radial, the second surface extending radially outward and away from the end of the base surface at a second angle relative to radial, the second angle greater than the base angle; and

a box member having a tapered thread with a root, a crest, a stab flank and a load flank, the stab flank of the box member thread having a base surface and a second surface, the base surface extending radially inward and away from the root at a base angle relative to radial, the second surface extending radially inward and away from the end of the base surface at a second angle relative to radial, the second angle greater than the base angle;

wherein a thread profile is defined by the root, crest, stab flank and load flank of at least one of the pin member or the box member, and an imaginary line that intersects the stab flank and the load flank of the thread profile such that the axial width of the thread ridge equals the axial width of the thread groove is a stepped line.

22. The connection of claim 21, wherein a first cycle of the stepped line is defined by a first line segment passing through a first thread ridge segment of the thread profile and a second line segment passing through a first thread groove segment of the thread profile, the second line segment angularly offset from the first line segment such that the first line segment is not parallel to the second line segment.

23. The connection of claim 22, where a second cycle of the stepped line is defined by a first line segment through a second thread ridge segment of the thread profile and a second line segment through a second thread groove segment of the thread profile, the first thread groove segment bounded by the first thread ridge segment and the second thread ridge segment, the second thread groove segment adjacent the second thread ridge segment, wherein the first line segment of the second thread ridge segment runs parallel to, but offset radially from the first line segment of the first thread ridge segment, wherein the second line segment of the second thread groove segment runs parallel to, but radially offset from the second line segment of the first thread groove segment.

24. The connection of claim 22 wherein:

a thread taper associated with the thread profile is angularly offset from both the first line segment and the second line segment.

25. The connection of claim 22 wherein the second line segment is offset from a central longitudinal axis of the pin member or box member by an angle that is greater than any angle of offset that may exist between the first line segment and the central longitudinal axis.

26. The connection of claim 21 wherein the thread profile is that of the pin member, and the box member also includes a thread profile with an imaginary line that intersects the stab flank and the load flank of the box member thread profile such that the axial width of the thread ridge equals the axial width of the thread groove is also a stepped line.

27. The connection of claim 26 wherein:

the imaginary line of the pin member intersects the stab flank at a pin thread intersecting location radially outward of a mid-point of the height of the stab flank of the pin member thread, the base surface of the stab flank of the pin member thread extends outward to the pin thread intersecting location;

the imaginary line of the box member intersects the stab flank at a box thread intersecting location radially inward of a mid-point of the height of the stab flank of the box member thread, the base surface of the stab flank of the box member thread extends inward to the box thread intersecting location.

28. The connection of claim 27 wherein:

when the connection is fully made up, the stab flank of the pin member thread and the stab flank of the box member thread are in substantive contact over a radial band.

29. The connection of claim 28 wherein the radial band of substantive contact extends a radial distance that is equal to or greater than at least seventeen percent of stab flank height.

30. The connection of claim 29 wherein:

when the connection is fully made up, the mid-point of the stab flank height of the pin member substantially aligns with the mid-point of the stab-flank height of the box member, and the radial band of substantive contact extends both radially outward of and radially inward of the substantially aligned mid-points.

31. The connection of claim 20 wherein:

the stab flank of the pin member thread interacts with the stab flank of the box member thread during connection make-up to move the load flank of the pin member thread into substantive contact with the load flank of the box member thread.

32. The connection of claim 31 wherein the stab flank of the pin member thread and the stab flank of the box member thread are configured to interact during connection make-up such that the load flank of the pin member thread moves into substantive

contact with the load flank of the box member thread before the pin member thread and the box member thread reach sixty-five percent of radial make-up engagement depth.