SUMMARY

The invention is defined in the independent claims. Some optional features of the invention are defined in the dependent claims.

The disclosed arrangements of an isolation, fire-safe gasket may provide electrical isolation as well as the reliability of defending against a fire while maintaining a competent seal either during a fire or everyday application.

One example of an isolation gasket for use between facing flanges of two flow conduit sections for fluid passage therethrough includes a flat metal core ring having an upper face opposing a lower face and an opening formed therein to allow fluid passage therethrough, wherein the flat metal core ring has a serrated ring positioned between an inner ring and an outer ring. The serrated ring having a plurality of serrations along the upper face and the lower face. The isolation gasket includes a first non-conductive layer on the upper face and the lower face of the inner ring to provide a dieletric barrier for the inner ring, a non-conductive coating on the plurality of serrations along the upper face and the lower face of the serrated ring to provide a dielectric barrier for the serrated ring, and a second non-conductive layer on the upper face and the lower face of the outer ring to provide a dielectric barrier for the outer ring. The isolation gasket also includes a fire resistant layer on the non-conductive coating that is positioned on the serrated ring, wherein the fire resistant layer spans from an outer edge of the serrated ring to a mid-region of the serrated ring and a third non-conductive layer on the non-conductive coating that is positioned on the serrated ring, wherein the third non-conductive layer spans from an inner edge of the serrated ring to the mid-region of the serrated ring, wherein the fire resistant layer abuts against the third non-conductive layer. In one arrangement, the fire resistant layer abuts against the third non-conductive layer at a mid-point between the inner edge and the outer edge of the serrated ring.

Exemplary materials for the isolation gasket include the non-conductive coating being made of polytetrafluoroethylene, the fire resistant layer being made of mica or aluminosilicate, the third non-conductive layer being made of biaxially-oriented filled polytetrafluoroethylene that may be used alone or in combination with one another.

In a first arrangement, the plurality of serrations have a corresponding plurality of alternating peaks and grooves, wherein each of the peaks has a first

axial width dimension and each of the grooves has a second axial width dimension, the first axial width dimension being substantially the same for each of the peaks, and the second axial width dimension being substantially the same for each of the grooves. In a second alternative arrangement, the plurality of serrations have a corresponding plurality of alternating peaks and grooves, wherein each of the peaks has a first axial width dimension that is substantially the same for each of the peaks, and wherein the plurality of grooves includes five groups that are orderly arranged across a width of the serrated ring, wherein the outer two groups of the plurality of grooves have a second axial width dimension, the middle two groups of the plurality of grooves have a third axial width dimension, and the center group of the plurality of grooves has a fourth axial dimension, wherein the fourth axial width dimension is larger than the third axial width dimension, and the third axial width dimension is larger than the second axial width dimension. In the second arrangement, the fourth axial width dimension, the third axial width dimension, and the second axial width dimension generally form a convex profile that spans across the width of the serrated ring.

In another example arrangement, a pair of joined flow conduit sections which are constructed and arranged with facing flanges, each flow conduit section having a through bore in combination with an isolation gasket for use between the facing flanges. The isolation gasket includes a flat metal core ring having an upper face opposing a lower face and an opening formed therein to allow fluid passage therethrough, wherein the flat metal core ring has a serrated ring positioned between an inner ring and an outer ring and the serrated ring has a plurality of serrations along the upper face and the lower face. The isolation gasket includes a first non-conductive layer on the upper and the lower faces of the inner ring, a non-conductive coating on the upper and the lower faces of the serrated ring, a second non-conductive layer on the upper and the lower faces of the outer ring, a fire resistant layer on the non-conductive coating that is positioned on the serrated ring, and a third non-conductive layer on the non-conductive coating that is positioned on the serrated ring, wherein the third non-conductive layer is adjacent the fire resistant layer. In one form, the fire resistant layer spans from an outside diameter of the serrated ring to a middle diameter of the serrated ring, and wherein the third

non-conductive layer spans from the middle diameter to an inside diameter of the serrated ring.

In one arrangement the combination further includes at least one isolating sleeve positioned in an aligned bore formed in each of the facing flanges, the isolating sleeve having a length that is substantially equal to a distance between an outer face of each of the flanges with the isolation gasket positioned between the facing flanges, at least one elongate metal fastener having opposing ends, the fastener received in the isolating sleeve for connecting the flanges to one another with the isolation gasket interposed therebetween, and an isolating washer positioned on each of the at least one elongate metal fastener abutting the outer face of the flange. In a first arrangement, the isolating washer includes a metal washer having opposing side surfaces with a sheet of dielectric material laminated to one of the opposing side surfaces and wherein the dielectric material abuts at least the outer face of the flange. In another arrangement, the isolating washer includes a metal core coated with a dielectric material. In one form, the isolating sleeve includes a sleeve made of one of glass reinforced polymer material, epoxy material, phenolic material, and meta-aramid material. In another form, the metal fastener includes a metal shaft threaded to receive a nut on at least one of the opposing ends.

In a first arrangement, the plurality of serrations have a corresponding plurality of alternating peaks and grooves, wherein each of the peaks has a first axial width dimension and each of the grooves has a second axial width dimension, the first axial width dimension being substantially the same for each of the peaks, and the second axial width dimension being substantially the same for each of the grooves.

In a second arrangement, the plurality of serrations have a corresponding plurality of alternating peaks and grooves, wherein each of the peaks has a first axial width dimension that is substantially the same for each of the peaks, and wherein the plurality of grooves includes five groups that are orderly arranged across a width of the serrated ring, wherein the outer two groups of the plurality of grooves have a second axial width dimension, the middle two groups of the plurality of grooves have a third axial width dimension, and the center group of the

plurality of grooves has a fourth axial dimension, wherein the fourth axial width dimension is larger than the third axial width dimension, and the third axial width dimension is larger than the second axial width dimension. In one form, the fourth axial width dimension, the third axial width dimension, and the second axial width dimension generally form a convex profile that spans across the width of the serrated ring.

In another example arrangement of an isolation gasket for use between facing flanges of two flow conduit sections for fluid passage therethrough, the isolation gasket includes a flat metal core ring having an upper face opposing a lower face and an opening formed therein to allow fluid passage therethrough. The flat metal core ring has a serrated ring positioned between an inner ring and an outer ring wherein the serrated ring having a plurality of serrations along the upper face and the lower face. A first non-conductive layer is positioned on the upper face and the lower face of the inner ring to provide a dieletric barrier for the inner ring, a second non-conductive layer on the upper face and the lower face of the outer ring to provide a dielectric barrier for the outer ring, and a non-conductive coating is applied on the plurality of serrations of the upper face and the lower face of the serrated ring to provide a dielectric barrier for the serrated ring. A fire resistant layer and a third non-conductive layer are arranged in a side by side orientation on the non-conductive coating applied on the plurality of serrations of the serrated ring, wherein each of the fire resistant layer and the third non-conductive layer covers approximately half of the serrated ring. In one arrangement, the fire resistant layer spans from an outer edge of the serrated ring to a mid-region of the serrated ring, and the third non-conductive layer spans from an inner edge of the serrated ring to the mid-region of the serrated ring such that the fire resistant layer and the third non-conductive layer do not overlap.

In a first arrangement of the isolation gasket, the plurality of serrations have a corresponding plurality of alternating peaks and grooves, wherein each of the peaks has a first axial width dimension and each of the grooves has a second axial width dimension, the first axial width dimension being substantially the same for each of the peaks, and the second axial width dimension being substantially the same for each of the grooves. In a second arrangement of the isolation gasket, the

plurality of serrations have a corresponding plurality of alternating peaks and grooves, wherein each of the peaks has a first axial width dimension that is substantially the same for each of the peaks, and wherein the plurality of grooves includes five groups that are orderly arranged across a width of the serrated ring, wherein the outer two groups of the plurality of grooves have a second axial width dimension, the middle two groups of the plurality of grooves have a third axial width dimension, and the center group of the plurality of grooves has a fourth axial dimension, wherein the fourth axial width dimension is larger than the third axial width dimension, and the third axial width dimension is larger than the second axial width dimension. In the second arrangement of the isolation gasket, the fourth axial width dimension, the third axial width dimension, and the second axial width dimension generally form a convex profile that spans across the width of the serrated ring.

Further forms, objects, features, aspects, benefits, advantages, and embodiments of the present invention will become apparent from a detailed description and drawings provided herewith. Non-limiting embodiments of the invention will now be described, by way of example only, and with reference to the accompanying drawings.

CLAIMS

What is claimed is:

1. An isolation gasket for use between facing flanges of two flow conduit sections for fluid passage therethrough, the isolation gasket comprising:

a flat metal core ring having an upper face opposing a lower face and an opening formed therein to allow fluid passage therethrough, the flat metal core ring having a serrated ring positioned between an inner ring and an outer ring, the serrated ring having a plurality of serrations along the upper face and the lower face, the plurality of serrations include a plurality of alternating peaks and grooves, wherein each of the peaks has an axial width dimension that is substantially the same for each of the peaks, and wherein each of the plurality of grooves has an axial width dimension arranged such that collectively the plurality of grooves forms a convex profile that spans across a width of the serrated ring;

a first non-conductive layer on the upper and the lower faces of the inner ring to provide a dieletric barrier;

a non-conductive coating on the upper and the lower faces of the serrated ring;

a second non-conductive layer on the upper and the lower faces of the outer ring to provide a dielectric barrier;

a fire resistant layer on the non-conductive coating that is positioned on the serrated ring; and

a third non-conductive layer on the non-conductive coating that is positioned on the serrated ring, wherein the third non-conductive layer is adjacent the fire resistant layer.

2. The isolation gasket of any preceding claim, wherein the fire resistant layer abuts against the third non-conductive layer at a mid-point between an inner edge and an outer edge of the serrated ring.

3. The isolation gasket of any preceding claim, wherein the fire resistant layer spans from an outside diameter of the serrated ring to a middle diameter of the serrated ring, and wherein the third non-conductive layer spans from the middle diameter to an inside diameter of the serrated ring.

4. The isolation gasket of any preceding claim, wherein the fire resistant layer and the third non-conductive layer are arranged in a side by side orientation on the non-conductive coating applied on the plurality of serrations of the serrated ring, wherein each of the fire resistant layer and the third non-conductive layer covers approximately half of the serrated ring.

5. The isolation gasket of any preceding claim, wherein the plurality of grooves includes five groups that are orderly arranged across a width of the serrated ring, wherein the outer two groups of the plurality of grooves have a second axial width dimension, the middle two groups of the plurality of grooves have a third axial width dimension, and the center group of the plurality of grooves has a fourth axial dimension, wherein the fourth axial width dimension is larger than the third axial width dimension, and the third axial width dimension is larger than the second axial width dimension.

6. The isolation gasket of claim 5, wherein the fourth axial width dimension, the third axial width dimension, and the second axial width dimension generally form a convex profile that spans across the width of the serrated ring.

7. The isolation gasket of any one of claims 4, claim 5 or claim 6 when appended directly to claim 1 or claim 2, wherein the fire resistant layer spans from an outside diameter of the serrated ring to a middle diameter of the serrated ring, and wherein the third non-conductive layer spans from the middle diameter to an inside diameter of the serrated ring.

8. The isolation gasket of any preceding claim, further comprising:

at least one isolating sleeve positioned in an aligned bore formed in each of the facing flanges, the isolating sleeve having a length that is substantially equal to a distance between an outer face of each of the flanges with the isolation gasket positioned between the facing flanges;

at least one elongate metal fastener having opposing ends, the fastener received in the isolating sleeve for connecting the flanges to one another with the isolation gasket interposed therebetween; and

an isolating washer positioned on each of the at least one elongate metal fastener abutting the outer face of the flange.

9. The isolation gasket of claim 8, wherein the isolating washer includes a metal washer having opposing side surfaces with a sheet of dielectric material laminated to one of the opposing side surfaces and wherein the dielectric material abuts at least the outer face of the flange.

10. The isolation gasket of any one of claims 8 to 9, wherein the isolating washer includes a metal core coated with a dielectric material.

11. The isolation gasket of any one of claims 8 to 10, wherein the isolating sleeve includes a sleeve made of one of glass reinforced polymer material, epoxy material, phenolic material, and meta-aramid material.

12. The isolation gasket of any one of claims 8 to 11, wherein the metal fastener includes a metal shaft threaded to receive a nut on at least one of the opposing ends.

13. The isolation gasket of any one of claims 7 to 12, wherein the plurality of grooves includes five groups that are orderly arranged across a width of the serrated ring, wherein the outer two groups of the plurality of grooves have a second axial width dimension, the middle two groups of the plurality of grooves have a third axial width dimension, and the center group of the plurality of grooves has a fourth axial dimension, wherein the fourth axial width dimension is larger than the third axial width dimension, and the third axial width dimension is larger than the second axial width dimension.

14. The isolation gasket of claim 13, wherein the fourth axial width dimension, the third axial width dimension, and the second axial width dimension generally form a convex profile that spans across the width of the serrated ring.

15. An isolation gasket for use between facing flanges of two flow conduit sections for fluid passage therethrough, the isolation gasket comprising:

a flat metal core ring having an upper face opposing a lower face and an opening formed therein to allow fluid passage therethrough, the flat metal core ring having a serrated ring positioned between an inner ring and an outer ring, the serrated ring having a plurality of serrations along the upper face and the lower face, wherein the plurality of serrations have a corresponding plurality of alternating peaks and grooves, wherein each of the peaks has a first axial width dimension that is substantially the same for each of the peaks, and wherein the plurality of grooves includes five groups that are orderly arranged across a width of the serrated ring, wherein the outer two groups of the plurality of grooves have a second axial width dimension, the middle two groups of the plurality of grooves have a third axial width dimension, and the center group of the plurality of grooves has a fourth axial dimension, wherein the fourth axial width dimension is larger than the third axial width dimension, and the third axial width dimension is larger than the second axial width dimension;

a first non-conductive layer on the upper face and the lower face of the inner ring to provide a dieletric barrier for the inner ring;

a second non-conductive layer on the upper face and the lower face of the outer ring to provide a dielectric barrier for the outer ring;

a non-conductive coating applied on the plurality of serrations of the upper face and the lower face of the serrated ring to provide a dielectric barrier for the serrated ring;

a fire resistant layer and a third non-conductive layer arranged in a side by side orientation on the non-conductive coating applied on the plurality of serrations of the serrated ring, wherein each of the fire resistant layer and the third non-conductive layer covers approximately half of the serrated ring.

16. The isolation gasket of claim 1, wherein the fire resistant layer spans from an outer edge of the serrated ring to a mid-region of the serrated ring, and the third non-conductive layer spans from an inner edge of the serrated ring to the mid-region of the

serrated ring such that the fire resistant layer and the third non-conductive layer do not overlap.

17. The isolation gasket of any preceding claim, wherein the non-conductive coating is made of polytetrafluoroethylene.

18. The isolation gasket of any preceding claim, wherein the fire resistant layer is made of mica or aluminosilicate.

19. The isolation gasket of any preceding claim, wherein the third non-conductive layer is made of biaxially-oriented filled polytetrafluoroethylene.

20. The isolation gasket of any one of claims 15 to 19, wherein the fourth axial width dimension, the third axial width dimension, and the second axial width dimension generally form a convex profile that spans across the width of the serrated ring.

21. An assembly comprising a pair of joined flow conduit sections which are constructed and arranged with facing flanges, each flow conduit section having a through bore; said pair of joined flow conduit sections having an isolation gasket according to any preceding claim disposed between said facing flanges.