CLAIMS

1. A fiber Bragg grating (FBG) sensor structure comprising:

an optical fiber portion having at least one FBG formed therein; and

a sleeve structure capable of transferring vibrations and/or strain along a length thereof;

wherein the optical fiber portion is disposed inside the sleeve structure and coupled to an inner circumference of the sleeve structure such that the wavelength of the optical fiber portion is variable under the transferred vibrations and/or strain, and wherein one or more portions of the optical fiber portion comprises a collar that is connected to the inner circumference of the sleeve structure.

2. The FBG sensor structure as claimed in claim 1, wherein the optical fiber portion is coupled to the sleeve structure such that the wavelength of the optical fiber portion is variable under amplitude and frequency of the transferred vibrations and/or strain.

~~3. The FBG sensor structure as claimed in claim 1 or 2, wherein the optical fiber portion is disposed inside the sleeve structure.~~

~~4. The FBG sensor structure as claimed in claim 3, wherein the optical fiber portion is coupled to an inner circumference of the sleeve structure.~~

~~5~~3. The FBG sensor structure as claimed in claim ~~4~~1 or 2, wherein the ends of the optical fiber portion are connected to the inner circumference of the sleeve structure.

~~6. The FBG sensor structure as claimed in claim 4, wherein one or more portions of the optical fiber portion comprises a collar, wherein the one or more collars are connected to the inner circumference of the sleeve structure.~~

~~7~~4. The FBG sensor structure as claimed in any of the preceding claims, wherein the sleeve structure comprises a resilient metallic tube.

~~8~~5. The FBG sensor structure as claimed in claim ~~7~~4, wherein the sleeve structure further comprises a protective cover on the resilient metallic tube.

~~9~~6. The FBG sensor structure as claimed in claim ~~8~~5, wherein the protective cover comprises a UV protection material.

~~10~~7. The FBG sensor structure as claimed in any of the preceding claims, further comprising a buffered fiber portion connected to at least one end of the optical fiber portion.

~~11~~8. The FBG sensor structure as claimed in claim ~~10~~7, wherein the buffered fiber portion extends along the length of the sleeve structure for optical connection of the optical fiber portion.

~~12~~9. The FBG sensor structure as claimed claim ~~11~~8, wherein two buffered fiber portions are connected at respective ends of the optical fiber portion.

~~13~~10. The FBG sensor structure as claimed in any of the preceding claims, wherein the sleeve structure is configured for suspending the optical fiber portion at a sensing location.

~~14~~11. The FBG sensor structure as claimed in any one of the preceding claims, wherein the optical fiber portion comprises a single fiber having an array of FBGs formed therein.

~~15~~12. The FBG sensor structure as claimed in any of claims 1 to ~~13~~10, wherein the FBG sensor structure comprises a plurality of optically interconnected optical fiber portions having respective FBGs formed therein, each optical fiber portion coupled to the sleeve structure such that the central wavelength of each FBG is variable under the transferred vibrations and/or strain.

~~16~~13. The FBG sensor structure as claimed in any of the preceding claims, wherein the optical fiber portion comprises a single mode fiber.

~~17~~14. The FBG sensor structure as claimed in claim ~~16~~13, wherein the optical fiber portion further comprises a loose sleeve disposed over the single mode fiber.

~~18~~15. The FBG sensor structure as claimed in any of the preceding claims, further comprising an interrogator optically connected to the one or more optical fiber portions, the interrogator configured to transmit signals to the one or more optical

fiber portions, and measure signals reflected from the one or more optical fiber portions.

~~19~~16. A method of fabricating a FBG sensor structure, the method comprising the steps of:

providing a optical fiber portion having at least one FBG formed therein; ~~and~~

coupling the optical fiber portion to an inner circumference of a sleeve structure capable of transferring vibrations and/or strain along a length thereof, such that the central wavelength of the FBG is variable under the transferred vibrations and/or strain;

attaching one or more portions of the optical fiber portion with a collar; and

connecting the collar to the inner circumference of the sleeve structure.

~~20. The method as claimed in claim 19, further comprising the step of coupling the optical fiber portion to an inner circumference of the sleeve structure.~~

~~21~~17. The method as claimed in claim ~~20~~16, further comprising the step of connecting the ends of the optical fiber portion to the inner circumference of the sleeve structure.

~~22. The method as claimed in claim 20, further comprising the steps of:~~

~~attaching one or more portions of the optical fiber portion with a collar; and~~

~~connecting the one or more collars to the inner circumference of the sleeve structure.~~

~~23~~18. The method as claimed in any one of claims ~~19~~ 16 to ~~22~~17, wherein one optical fiber portion and one sleeve structure forms one sensing element.

~~24~~19. The method as claimed in claim ~~23~~18, further comprising the step of connecting a plurality of sensing elements to form a sensor array.

~~25~~20. The method as claimed in claim ~~19~~16, wherein the optical fiber portion has an array of FBGs formed therein.

~~26~~21. The method as claimed in claim ~~19~~16, comprising fabricating a plurality of optically interconnected optical fiber portions, and feeding said plurality of interconnected optical fiber portions into a single sleeve structure to form a sensor array.

~~27~~22. A method of employing a FBG sensor structure ~~comprising an optical fiber portion having at least one FBG formed therein~~as claimed in claim 1; the method comprising detecting wavelength variations of the optical fiber portion under vibrations and/or strain transferred using ~~a~~ the collar that is coupled to the inner circumference of the sleeve structure, and the sleeve structure is coupled to the optical fiber portion.

~~28~~23. The method as claimed in claim ~~27~~22, further comprising the step of suspending the FBG sensor structure between two substantially fixed mounting elements, such that the sleeve structure extends along a structural feature disposed between the mounting elements.

~~29~~24. The method as claimed in claim ~~28~~23, wherein disturbances experienced by the structural feature are detected by the sleeve structure as vibrations and/or strain and transferred to the optical fiber portion, resulting in a variation of wavelength of the FBG.

~~30~~25. The method as claimed in claim ~~28~~23, wherein the FBG sensor structure is suspended in a pre-tensioned fashion.

~~31~~26. The method as claimed in claim ~~28~~23, wherein the structural feature comprises a fence, and the mounting elements comprise of the fence near the struts of the fence.

~~32~~27. The method as claimed in claim ~~28~~23, wherein the FBG sensor structure is fixed by way of metal plates connected to the mounting elements.

~~33~~28. The method as claimed in any one of claims ~~28~~ 23 to ~~32~~27, wherein the FBG structure is supported in regions between the mounting elements in a manner such as to allow transfer of the vibrations and/or strain using the sleeve structure coupled to the optical fiber portion.

~~34~~29. The method as claimed in claim ~~33~~28, wherein the FBG structure is supported in the regions using a first securing means to hold the sleeve structure, and a second securing means coupled to the first securing means, the second securing means secured to the structural feature.