Claims

1. A flexible boroscope (60) having a first end (62) corresponding to the remote end of the boroscope and a second end (64), the first end (62) of the boroscope (60) has an optical fibre (66, 67), a light source (68) and a lens (70), the optical fibre (66, 67) extends from the first end (62) of the boroscope (60) to the second end (64) of the boroscope (60), a laser optical fibre (71) extends from the lens (70) at the first end (62) of the boroscope (60) to the second end (64) of the boroscope (60), a laser source (76) is arranged to direct a laser beam into the laser optical fibre (71) at the second end (64) of the boroscope (60), **characterised in that** the first end (62) of the boroscope (60) has a transmissive diffractive optical element (74), the lens (70) is provided between the optical fibre (71) and the transmissive diffractive optical element (74), the transmissive diffractive optical element (74) is arranged to produce a laser beam (L) with a predetermined shape with the outline of the shape defined by a straight line and an arcuate line, and a focal length probe (77) extending from the first end (62) of the boroscope (60).

2. A boroscope as claimed in claim 1 wherein the first end (62) of the boroscope (60) has a beam expander (72), the beam expander (72) is provided between the laser optical fibre (71) and the lens (70) and the lens (70) is provided between the beam expander (72) and the transmissive diffractive optical element (74).
3. A boroscope as claimed in claim 1 or claim 2 wherein the transmissive diffractive optical element (24) is arranged to produce a laser beam with a half circular shape, a part-circular shape or a part-elliptical shape.
4. A boroscope as claimed in any of claims 1 to 3 wherein the transmissive diffractive optical element (24) is arranged to produce a laser beam (L) with uniform intensity.

5. A method of processing a component (38) within an assembled apparatus (10), the apparatus (10) comprising a casing (50, 58) enclosing the component (38), the casing (50, 58) having at least one aperture (52, 56) extending there-through, the method comprising:-

a) inserting a flexible boroscope (60) through the aperture (52, 56), the boroscope (60) having a first end (62) corresponding to the remote end of the boroscope and a second end (64), the first end (62) of the boroscope (60) has an optical fibre (66, 67), a light source (68), a lens (70) and a transmissive diffractive optical element (74),

the optical fibre (66, 67) extends from the first end (62) of the boroscope (60) to the second end (64) of the boroscope (60), a laser optical fibre (71) extends from the lens (70) at the first end (62) of the boroscope (60) to the second end (64) of the boroscope (60), a laser source (76) is arranged to direct a laser beam into the laser optical fibre (66, 67) at the second end (64) of the boroscope (60), the lens (70) is provided between the optical fibre (66, 67) and the transmissive diffractive optical element (74), the transmissive diffractive optical element (74) is arranged to produce a laser beam (L) with a predetermined shape with the outline of the shape defined by a straight line and an arcuate line and a focal length probe (77) extending from the first end of the boroscope.

b) viewing the assembled apparatus (10) within the casing (50, 58) using the optical fibre (66, 67),

c) viewing the assembled apparatus (10) within the casing (50, 58) using the optical fibre (66, 67) while moving the working head of the boroscope (60) to a predetermined position on the component (38),

d) contacting the component (38) with the focal length probe (77) and maintaining the focal length probe (77) in contact with the component (38),

e) supplying a laser beam through the laser optical fibre (66, 67) to the lens (70),

f) directing a laser beam (L) with a predetermined shape onto the surface of the component (38) to process a region of the surface of the component (38) with the predetermined shape, and

g) viewing the component (38) with the optical fibre (66, 67) to monitor the processing of the component (38).

6. A method as claimed in claim 5 wherein step f) comprises cleaning the surface of the component (38), ablating the surface of the component (38) or unblocking a cooling aperture.

7. A method as claimed in claim 5 wherein step f) comprises supplying material onto the region of the surface of the component (38) to rebuild the component (38).

8. A method as claimed in any of claims 5 to 7 wherein the transmissive diffractive optical element (74) is arranged to produce a laser beam (L) with a half circular shape, a part-circular shape or a part-elliptical shape.

9. A method as claimed in any of claims 5 to 8 wherein the transmissive diffractive optical element (74) is arranged to produce a laser beam with uniform intensity.

10. A method as claimed in any of claims 5 to 9 wherein the assembled apparatus (10) comprises a gas turbine engine.

11. A method as claimed in claim 10 wherein the component (38) comprises a compressor blade, a compressor vane, a turbine blade or a turbine vane.

12. A method as claimed in claim 11 wherein the component (38) comprises an abradable liner, wherein the abradable liner is on a casing located around a stage of turbine blades or a stage of compressor blades.