CLAIMS

What is claimed is:

1. A guide wire arrangement, comprising:

an elongate coil element having two opposing ends;

a force transmitting element arranged at one of the two opposing ends of the coil element;

a sensor assembly arranged in the coil element at a predefined distance away from the force transmitting element; and

a core wire extending from the force transmitting element to the sensor assembly through the coil element;

wherein the coil element is configured to allow the core wire to be moveable relative to the sensor assembly and the sensor assembly is configured to detect movement of the core wire relative to the sensor assembly upon force impact on the force transmitting element, and

wherein the sensor assembly comprises a ring shaped sensor, the ring-shaped sensor comprising a plurality of suspended beams and a suspended ring connecting the plurality of suspended beams.

2. The guide wire arrangement of claim 1, wherein the core wire extends adjacent to the sensor assembly or through the sensor assembly.

3. The guide wire arrangement of claim 1, further comprising

a further core wire extending from another of the two opposing ends of the coil element into the coil element such that a free end portion of the core wire overlaps with a free end portion of the further core wire in a substantially parallel and spaced apart arrangement within the coil element.

4. The guide wire arrangement of claim 1, wherein the core wire is configured to taper in a direction away from the force transmitting element.

5. The guide wire arrangement of claim 3, wherein the core wire is configured to be moveable relative to the further core wire.

6. The guide wire arrangement of claim 1, wherein the coil element comprises a plurality of coil regions with varying coil wire diameters, spring constants and/or coil spacings.

7. The guide wire arrangement of claim 1, wherein the coil element comprises a first coil region and a second coil region positioned adjacent to the first coil region, wherein the first coil region is positioned between the force transmitting element and the second coil region and the first coil region comprises a coil wire diameter smaller than the second coil region and a coil spacing wider than the second coil region.

8. The guide wire arrangement of claim 1, wherein the sensor assembly further comprises :

a flexible cable;

~~a sensor;~~ and

a chip;

wherein the ring-shaped sensor and the chip are attached onto the flexible cable.

9. The guide wire arrangement of claim 8, wherein a portion of the flexible cable upon which the ring-shaped sensor is attached is arranged between two windings of the coil element with ~~its normal~~the flexible cable parallel to ~~the~~ a longitudinal axis of the coil element.

10. The guide wire arrangement of claim 8, wherein the ring-shaped sensor and the chip are attached onto the flexible cable by a flip chip process.

11. The guide wire arrangement of claim 8, wherein the ring-shaped sensor is positioned between the force transmitting element and the chip.

12. The guide wire arrangement of claim 8, wherein the sensor assembly further comprises a plurality of electrically conductive wires attached to the flexible cable.

13. The guide wire arrangement of claim 8, wherein the ring-shaped sensor comprises a microelectromechanical system (MEMS) sensor.

~~14. The guide wire arrangement of claim 8, wherein the sensor is a ring-shaped sensor comprising:~~

~~a plurality of suspended beams; and~~

~~a suspended ring connecting the plurality of suspended beams in the centre.~~

~~15~~14. The guide wire arrangement of claim ~~14~~1, wherein the core wire extends from the force transmitting element through the suspended ring of the ring-shaped sensor.

~~16~~15. The guide wire arrangement of claim ~~14~~1, wherein the plurality of suspended beams comprises four suspended beams.

~~17~~16. The guide wire arrangement of claim ~~14~~1, wherein the ring-shaped sensor further comprises a layer of polymer coating disposed over the plurality of suspended beams and the suspended ring.

~~18~~17. The guide wire arrangement of claim 8, wherein the chip comprises an application-specific integrated circuit (ASIC).

~~19~~18. The guide wire arrangement of claim 1, wherein the force transmitting element comprises a rounded tip structure.

CLAIMS

What is claimed is:

1. A guide wire arrangement, comprising:

an elongate coil element having two opposing ends;

a force transmitting element arranged at one of the two opposing ends of the coil element;

a sensor assembly arranged in the coil element at a predefined distance away from the force transmitting element; and

a core wire extending from the force transmitting element to the sensor assembly through the coil element;

wherein the coil element is configured to allow the core wire to be moveable relative to the sensor assembly and the sensor assembly is configured to detect movement of the core wire relative to the sensor assembly upon force impact on the force transmitting element, and

wherein the sensor assembly comprises a ring shaped sensor, the ring-shaped sensor comprising a plurality of suspended beams and a suspended ring connecting the plurality of suspended beams.

2. The guide wire arrangement of claim 1, wherein the core wire extends adjacent to the sensor assembly or through the sensor assembly.

3. The guide wire arrangement of claim 1, further comprising

a further core wire extending from another of the two opposing ends of the coil element into the coil element such that a free end portion of the core wire overlaps with a free end portion of the further core wire in a substantially parallel and spaced apart arrangement within the coil element.

4. The guide wire arrangement of claim 1, wherein the core wire is configured to taper in a direction away from the force transmitting element.

5. The guide wire arrangement of claim 3, wherein the core wire is configured to be moveable relative to the further core wire.

6. The guide wire arrangement of claim 1, wherein the coil element comprises a plurality of coil regions with varying coil wire diameters, spring constants and/or coil spacings.

7. The guide wire arrangement of claim 1, wherein the coil element comprises a first coil region and a second coil region positioned adjacent to the first coil region, wherein the first coil region is positioned between the force transmitting element and the second coil region and the first coil region comprises a coil wire diameter smaller than the second coil region and a coil spacing wider than the second coil region.

8. The guide wire arrangement of claim 1, wherein the sensor assembly further comprises :

a flexible cable;

and

a chip;

wherein the ring-shaped sensor and the chip are attached onto the flexible cable.

9. The guide wire arrangement of claim 8, wherein a portion of the flexible cable upon which the ring-shaped sensor is attached is arranged between two windings of the coil element with the flexible cable parallel to a longitudinal axis of the coil element.

10. The guide wire arrangement of claim 8, wherein the ring-shaped sensor and the chip are attached onto the flexible cable by a flip chip process.

11. The guide wire arrangement of claim 8, wherein the ring-shaped sensor is positioned between the force transmitting element and the chip.

12. The guide wire arrangement of claim 8, wherein the sensor assembly further comprises a plurality of electrically conductive wires attached to the flexible cable.

13. The guide wire arrangement of claim 8, wherein the ring-shaped sensor comprises a microelectromechanical system (MEMS) sensor.

14. The guide wire arrangement of claim 1, wherein the core wire extends from the force transmitting element through the suspended ring of the ring-shaped sensor.

15. The guide wire arrangement of claim 1, wherein the plurality of suspended beams comprises four suspended beams.

16. The guide wire arrangement of claim 1, wherein the ring-shaped sensor further comprises a layer of polymer coating disposed over the plurality of suspended beams and the suspended ring.

17. The guide wire arrangement of claim 8, wherein the chip comprises an application-specific integrated circuit (ASIC).

18. The guide wire arrangement of claim 1, wherein the force transmitting element comprises a rounded tip structure.