Claims

1. A method for manufacturing an optical fiber sensor device, comprising an enclosure delimiting a cavity and an optical fiber sensor, said optical fiber sensor comprising an optical fiber and a holding device of the sensor secured to the optical fiber, said holding device being passed through by the optical fiber between two fixing points provided on said holding device, comprising the steps of:

- positioning the optical fiber sensor in the enclosure so as to have the fiber pass through two passage openings provided on the enclosure, the optical fiber extending generally along a longitudinal axis in said cavity, which delimits two portions of optical fibers in the enclosure, on either side of the holding device, each portion of fiber extending between one of said fixing points of the holding device and one of said passage openings of the enclosure, substantially along a straight line;
- holding the optical fiber sensor in position;
- producing a differential elongation of the enclosure in relation to the optical fiber sensor in the longitudinal direction, and toward the outside of the enclosure, while the optical fiber sensor remains held in position;
- fixing the optical fiber to the enclosure at said passage openings; and
- bringing the enclosure into a position of balance.

2. The manufacturing method as claimed in claim 1, wherein said step of differential elongation of the fiber is performed by mechanically stretching the enclosure in said longitudinal direction, on each side of the enclosure, toward the outside of the enclosure, and in that the enclosure is brought into said position of balance by relaxing the enclosure.

3. The manufacturing method as claimed in claim 2, wherein the differential elongation Δ_L of the enclosure in relation to the optical fiber sensor satisfies a constraint relating to the ambient temperature T_S at the time of the fixing of the fiber to the enclosure, to the maximum operating temperature T_{max} of the fiber sensor, to the thermal expansion coefficient λ_C of the fiber sensor and to the thermal expansion coefficient λ_P of the enclosure.

4. The manufacturing method as claimed in claim 3, wherein said constraint is defined by the inequality:

$$\Delta_L \geq \frac{L_P}{2}.\lambda_P(T_{max} - T_S) - \frac{L_C}{2}.\lambda_C(T_{max} - T_S),$$

in which λ_C denotes the thermal expansion coefficient of the fiber sensor, λ_P the thermal expansion coefficient of the enclosure, L_C denotes the length of the fiber sensor, L_P denotes the length of the enclosure, T_S the ambient temperature at the time of the fixing of the fiber to the enclosure, and T_{max} the maximum operating temperature of the sensor.

5. The manufacturing method as claimed in claim 1, wherein said step of differential elongation is performed by differential thermal expansion of the enclosure relative to the optical fiber sensor by increasing the temperature up to an expansion temperature greater than the maximum operating temperature defined for the optical fiber sensor device, and wherein the enclosure is brought into said position of balance by bringing the temperature to a temperature less than the expansion temperature.

6. The manufacturing method as claimed in claim 5, wherein the enclosure is chosen so as to have a thermal expansion coefficient according to the equation:

$$L_P\lambda_P > L_C\lambda_C,$$

in which λ_C denotes the thermal expansion coefficient of the holding device of the sensor, λ_P the thermal expansion coefficient of the enclosure, L_C denotes the length of the holding device, and L_P denotes the length of the enclosure.

7. The manufacturing method as claimed in claim 6, wherein the differential elongation of the enclosure is equal to:

$$\Delta'_L = \frac{L_P}{2}.\lambda_P(T - T_1) - \frac{L_C}{2}.\lambda_C(T - T_1)$$

in which λ_C denotes the thermal expansion coefficient of the sensor, λ_P the thermal expansion coefficient of the enclosure, L_C denotes the length of the holding device, L_P denotes the length of the enclosure, T the operating temperature, and T_1 the expansion temperature.

8. The manufacturing method as claimed in claim 1, wherein the step of fixing of the fiber to the enclosure at the passage openings comprises a gluing of the fiber at the blocking points.

9. The manufacturing method as claimed in claim 1, comprising the fixing of the fiber sensor to the enclosure in at least one connection zone.

10. The manufacturing method as claimed in claim 9, wherein the fixing of the sensor to the enclosure in at least one connection zone is performed by gluing.

11. The manufacturing method as claimed in claim 1, wherein the step of positioning of the optical fiber sensor comprises the longitudinal positioning of the optical fiber sensor substantially in the middle of the enclosure.

12. The manufacturing method as claimed in claim 1, wherein the sensor is a hydrophone.