CLAIMS

1. A device for detecting corrosion of a metal part comprising
   - a housing (1) which is a hollow cylinder comprising a proximal end (1.1) located proximate to the metal part upon installation of the device, and a distal end (1.2) located away from the metal part upon installation of the device;
   - a display (2) having at least a part which is located inside the housing (1);
   - a spring (3) located inside the housing (1) in a compressed manner, pushing the display (2) outwardly; and
   - a sensor (4) located in a manner that associates the housing (1) with the display (2), comprising a corroded portion (4.1) located outside the housing (1),

   wherein the corroded portion (4.1) of the sensor (4) has a diameter in a range of 0.6 mm to 1.5 mm.

2. The device according to claim 1, wherein the corroded portion (4.1) of the sensor (4) has a length in a range of 1 mm to 30 mm.

3. The device according to claim 1, wherein the corroded portion (4.1) of the sensor (4) is positioned in a range of 4 mm to 8 mm away from the proximal end (1.1) of the housing (1) or a plane of an external surface of the housing (1) that is closest to the metal part.

4. The device according to claim 1, wherein the sensor (4) further comprises a first end (4.2) attached to the housing (1) and a second end (4.3) attached to the display (2) in a manner that the display (2) being attached in an initial position inside the housing (1) upon installation of the device and is at least partially pushed out of the housing (1) when the corroded portion (4.1) of the sensor (4) is corroded until it is weakened or broken.

5. The device according to any one of claims 1 to 4, wherein the corroded portion (4.1) of the sensor (4) is placed transverse to a longitudinal axis of the housing (1).

6. The device according to any one of claims 1 to 4, wherein the corroded portion (4.1) of the sensor (4) is placed in a same direction as the longitudinal axis of the housing (1).

7. The device according to claim 1, wherein the housing (1) further comprises
   - a concave portion (1.3) being formed of a first extending portion (1.3.1) and a second extending portion (1.3.2) which extend downwardly and converge each other to form the concave portion (1.3) from the proximal end (1.1) or from the side wall of the housing (1) for supporting the corroded portion (4.1) of the sensor (4);
   - an opening hole (1.4) located at the distal end (1.2).

8. The device according to claim 1, wherein the housing (1) further comprises
   - at least two movement controlling portions (1.5) which are located opposite to each other, each having at least two ridges extending longitudinally from an internal surface of the housing (1); and
   - an abutting portion (1.6) including a receiving portion (1.6.1) located at the internal surface of the housing (1) and a bar (1.6.2) located opposite to the receiving portion (1.6.1) extending from the internal surface of the housing (1) to the receiving portion (1.6.1) for supporting the pushing of the spring (3).

9. The device according to claim 7, wherein the concave portion (1.3) further comprises
   - a fastening hole (1.3.3) provided to fasten the sensor (4);
   - an inserted portion (1.3.4) located at the first extending portion (1.3.1) to allow the corroded portion (4.1) of the sensor (4) to come outside; and
   - an opening (1.3.5) located at a lower side of the concave portion (1.3) for supporting an end of the display (2).

10. The device according to claim 9, wherein the inserted portion (1.3.4) is a hole located at the first extending portion (1.3.1), or a hollow protrusion extending horizontally from the first extending portion (1.3.1).

11. The device according to claim 1, wherein the housing (1) further comprises a locking bar (1.7), which comprises a plurality of locking slits (1.7.1) located at an external surface of the housing (1), with a first inclined portion (1.7.1.1) inclined downwardly toward the distal end (1.2) of the housing (1) and a second inclined portion (1.7.1.2) inclined toward a lateral side of the locking slits (1.7.1).

12. The device according to claim 1, wherein the display (2) comprises

- a body (2.1) comprising a proximal end (2.1.1) located proximate to the metal part upon installation of the device, a distal end (2.1.2) located away from the metal part upon installation of the device, an opening (2.1.3) located longitudinally, and a plurality of protrusions (2.1.4) extending transversely at corners of the proximal end (2.1.1) and the distal end (2.1.2);
- a sensor connecting portion (2.2) comprising a body (2.2.1) connected to the proximal end (2.1.1) of the body (2.1), and a sensor supporting portion (2.2.2) for supporting the sensor (4);
- a display portion (2.3) comprising a bar (2.3.1) assembled in an extendable manner to the distal end (2.1.2) of the body (2.1), and a flange (2.3.2) connected to an end of the bar (2.3.1); and
- a spring supporting portion (2.4) extending from an internal surface of the distal end (2.1.2) of the body (2.1) for supporting the spring (3).

13. The device according to claim 12, wherein the sensor supporting portion (2.2.2) of the sensor connecting portion (2.2) of the display (2) comprises a first protrusion (2.2.2.1) and a second protrusion (2.2.2.2) extending from the body (2.2.1) of the sensor connecting portion (2.2) at the top, the first protrusion (2.2.2.1) and the second protrusion (2.2.2.2) being inclined toward each other, wherein the end of the first protrusion (2.2.2.1) supports the sensor (4), and the second protrusion (2.2.2.2) comprises a fastening hole (2.2.2.2.1) provided to allow the sensor (4) to be attached to the second protrusion (2.2.2.2).

14. The device according to claim 12, wherein the sensor supporting portion (2.2.2) of the sensor connecting portion (2.2) comprises a first protrusion (2.2.2.1) having a fastening hole (2.2.2.1.1) for the sensor (4) to be inserted along a vertical axis.

15. The device according to claim 7, wherein the housing (1) further comprises an abutting surface (1.9) provided at a lower side of the concave portion (1.3).

16. The device according to claim 13, wherein the display (2) further comprises an abutting portion (2.5) provided at a lower side of the first protrusion (2.2.2.1) of the sensor

supporting portion (2.2.2) facing outwardly for abutting against the abutting surface (1.9).

17. The device according to claim 11 further comprises an engaging member (5) comprising

- a flange (5.1) having a central opening (5.1.1) for the housing (1) to be inserted, the flange (5.1) accommodating the external surface of an insulation covering the metal part;
- at least two upward protrusions (5.2) located opposite to each other extending upwardly from an edge of the central opening (5.1.1); and
- at least two locking protrusions (5.3) located between the upward protrusions (5.2), the locking protrusions (5.3) comprising a protrusion (5.3.1) extending upwardly from the edge of the central opening (5.1.1), an inclined protrusion (5.3.2) located at an end of the protrusion (5.3.1) such that it faces inwardly, with a lower surface inclined upwardly to move past the first inclined portion (1.7.1.1) of the locking bar (1.7) in a direction, and an inclined portion (5.3.3) provided such that it is in contact with the second inclined portion (1.7.1.2) of the locking bar (1.7).

18. The device according to any one of claims 1 to 17, wherein the sensor (4) is a wire which is made of a composition comprising carbon or alloy.

19. A method for detecting corrosion of a metal part comprising installing a device comprising

- a housing (1) which is a hollow cylinder comprising a proximal end (1.1) located proximate to the metal part upon installation of the device, and a distal end (1.2) located away from the metal part upon installation of the device;
- a display (2) having at least a part which is located inside the housing (1);
- a spring (3) located inside the housing (1) in a compressed manner, pushing the display (2) outwardly; and
- a sensor (4) located in a manner that associates the housing (1) with the display (2), comprising a corroded portion (4.1), wherein the corroded portion (4.1) is located

outside the housing (1), and in a same condition with the metal part, and the corroded portion (4.1) of the sensor (4) has a diameter in a range of 0.6 to 1.5 mm.

20. The method according to claim 19 wherein the housing (1) is placed perpendicularly to a longitudinal axis of the metal part.

21. The method according to claim 19 or 20, wherein the corroded portion (4.1) of the sensor (4) is placed transverse to a longitudinal axis of the housing (1).

22. The method according to claim 19 or 20, wherein the corroded portion (4.1) of the sensor (4) is placed in a same direction as the longitudinal axis of the housing (1).

23. The method according to any one of claims 19 to 22, wherein the metal part is a pipe or an elongated tube-like object.

24. The method according to claim 19, wherein the device is installed at a lowest portion of the metal part.

25. The method according to any one of claims 19 to 24 further comprises assembling the housing (1) to an engaging member (5) having a flange (5.1) with a central opening (5.1.1) by inserting the housing (1) into the central opening (5.1.1) to secure the housing (1) with the engaging member (5), wherein the flange (5.1) is accommodating the external surface of an insulation covering metal part.

26. The method according to claim 25, wherein the engaging member (5) further comprises a detach mechanism so that when the housing (1) is rotated, the housing (1) is removed from the installing position.