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Claims

1. An apparatus for detecting flaws in a wall of a metallic pipe containing a fluid, comprising:
a collapsible supporting structure for supporting the apparatus,
5 wherein an axis of the apparatus is at or near an axis of the metallic pipe;
a plurality of sensors for sensing magnetic field signal from the metallic pipe, the plurality of sensors configured to be distributed around an inner circumference of the pipe without contacting a surface
10 of an inner wall of the metallic pipe;
a processing module for receiving sensed data from the plurality of the sensors; and
one or more battery module for electrically powering the plurality of sensors and the processing module.
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2. The apparatus of claim 1, further comprising a nose module for facilitating the apparatus to pass through an opening of a pipe feature.
3. The apparatus of claim 1, wherein the plurality of sensors comprises a
20 plurality of the sensor arrays, and wherein each sensor array includes a subset of the plurality of sensors.
4. The apparatus of claim 3, wherein each sensor array comprises 16 sensors.
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5. The apparatus of claim 4, wherein the distance between the sensors is about 15 mm.
6. The apparatus of claim 3, where in the subset of the plurality of the
30 sensors are mounted on a flexible Printed Circuit Board (PCB).
7. The apparatus of claim 3, wherein the subset of the plurality of the sensors are mounted on three rigid Printed Circuit Board (PCBs).

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8. The apparatus of claim 6 or 7, wherein each sensor array includes a body and a pair of flexible arms extended from opposite direction the body, and wherein the PCB and the subset of the plurality of the sensors are mounted within the pair flexible arms.
9. The apparatus of claim 8, wherein the body further comprises a connector for transmitting the sensed data to the processing module.
10. The apparatus of claim 3, wherein each sensor array is mounted on a top end of a sensor petal.
11. The apparatus of claim 10, wherein the sensor petal is pivotably mounted on a petal plate, wherein the sensor petal is configured in an extended initial state.
12. The apparatus of claim 3, wherein the plurality of the sensor arrays form a continuous circumference in the proximity of the surface.
13. The apparatus of claim 12, wherein the plurality of the sensor arrays are evenly distributed on the continuous circumference.
14. The apparatus of claim 12, wherein a distance between the sensor arrays and the surface of the inner wall of the metallic pipe is in the range of 10 cm-0.5 cm.
15. The apparatus of claim 3, wherein the plurality of sensors are included in two sensor array sets.
16. The apparatus of claim 11, wherein the sensor petal is substantially perpendicular to an axis of the apparatus when the sensor petal is in the extended initial state.

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17. The apparatus of claim 11, wherein the sensor petal is collapsible when the apparatus passes through an opening of a pipe feature.
18. The apparatus of claim 1, wherein plurality of sensors comprises metal magnetic memory (MMM) sensors.
19. The apparatus of claim 1, wherein plurality of sensors comprises electromagnetic (EM) sensors.
20. The apparatus of claim 1, wherein plurality of sensors comprises metal magnetic memory (MMM) sensors and electromagnetic (EM) sensors.
21. The apparatus of claim 1, wherein collapsible supporting structure comprises a plurality sets of supporting petals, each set of the supporting petals comprises a plurality of supporting petals contacting the surface of the inner wall of the metallic pipe.
22. The apparatus of claim 21, wherein each supporting petal and the axis of the apparatus form an angle in the range of 65°-85° when the supporting petal is in an extended state.
23. The apparatus of claim 21, wherein a front set of the supporting petals comprising a sail for enabling the fluid to drive the apparatus.
24. The apparatus of claim 1, further comprising at least one tow link for connecting the processing module with the one or more battery modules, or for connecting two battery modules.
25. A method for sensing a wall of a metallic pipe containing a fluid, comprising:
positioning an axis of an apparatus at or near an axis of the metallic pipe;

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- arranging a plurality of metal magnetic memory (MMM) sensors on the apparatus around an inner circumference of the pipe without contacting the inner circumference of the metallic pipe; driving the apparatus within the pipe by fluid flow; and
- 5 sensing residual magnetic field signals generated from the wall of the metallic pipe.
26. The method of claim 25, further comprising identifying a defect on the wall of the metallic pipe based on sensed residual magnetic field
- 10 signals.
27. The method of claim 25, further comprising sensing a second set of data of the metallic wall from at least one electromagnetic (EM) sensor.