

Claims

1. A sensor unit for monitoring a tubular adjacent a fingerboard latch assembly mounted on a fingerboard comprising a latch bracket and a latch rotatably supported on the
5 latch bracket, wherein the sensor unit comprises:
a sensor configured to sense an adjacent tubular;
a processor arranged to receive the output of the sensor and to generate a tubular monitor signal representing the presence or absence and/or representing the position of an adjacent tubular.
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2. A sensor unit according to claim 1, where the sensor unit further comprises a wireless communication unit arranged to wirelessly communicate the tubular monitor signal.
- 15 3. A sensor unit according to claim 2, wherein the wireless communication unit comprises a radio communication unit.
4. A sensor unit according to claim 3, where the wireless communication unit is arranged to wirelessly communicate utilising a wavelength that is less than the minimum
20 spacing between tubulars mounted in the fingerboard.
5. A sensor unit according to any one of the preceding claims, wherein the sensor is configured to sense the position of an adjacent tubular.
- 25 6. A sensor unit according to any one of the preceding claims, wherein the sensor is configured to sense the speed and direction of movement of an adjacent tubular.
7. A sensor unit according to any one of the preceding claims, wherein the sensor implements one of ultrasonic, acoustic, electromagnetic, magnetic, radio-frequency,
30 microwave, ultra-wideband, optical, infrared, imaging or inductive sensing.
8. A sensor unit according to any one of the preceding claims, wherein the sensor unit

is arranged to be mounted on the latch.

9. A sensor unit according to claim 8, wherein the sensor unit includes a fitment that fits within an aperture in the latch.

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10. A sensor unit according to claim 9, wherein the sensor unit further comprises a retaining member configured to engage with the fitment and retain the sensor unit in the aperture.

10 11. A sensor unit according to claim 8, wherein the sensor unit is encapsulated within the latch.

12. A sensor unit according to claim 11, wherein the latch is made from a material that is transparent to sensor technology of the sensor.

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13. A sensor unit according to any one of the preceding claims, further comprising a housing that houses electronic components of the sensor unit.

14. A sensor unit according to claim 13, wherein the housing is made from a plastic
20 that is resistant to ultraviolet radiation, for example polyether ether ketone.

15. A sensor unit according to claim 13 or 14, wherein the sensor unit incorporates shock adsorbing material or features arranged to reduce shock to the electronic components.

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16. A sensor unit according to claim 15, wherein the shock adsorbing material or features to reduce shock to the electronic components to less than 400g.

17. A sensor unit according to claim 15 or 16, wherein the shock adsorbing material or
30 features allow internal electronic components to move by at least 1mm in any direction.

18. A sensor unit according to any one of claims 15 to 17, wherein the shock adsorbing

material or features that have a compression set of less than 30%.

19. A sensor unit according to any one of the preceding claims, further comprising a near-field communication unit arranged to perform near-field communication.

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20. A sensor unit according to claim 19, wherein the sensor unit includes an electromagnetic probe that is a coil, and the near-field communication unit is arranged to perform near-field communication using the coil as an antenna.

10 21. A sensor unit according to any one of the preceding claims, wherein the sensor includes two electromagnetic probes spaced apart.

22. A sensor unit according to claim 21, wherein the output of the sensor is a differential signal taken between the two electromagnetic probes.

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23. A sensor unit according to any one of the preceding claims, wherein the tubular monitor signal further comprises metadata which is logged electronically including date and time.

20 24. A sensor unit according to claim 23, wherein the metadata includes any one or more of: RFID, sensor identity, tubular presence, tubular absence, latch identity, number of latch cycles, number of tubular detections, count of open, count of closed, speed, acceleration, angle, vibration, battery charge, signal level.

25 25. A sensor unit according to any one of the preceding claims, wherein the sensor unit further includes a location device arranged to detect the location of the sensor unit on the fingerboard, and the metadata includes the location of the sensor unit detected by the location device.

30 26. A sensor unit according to claim 25, wherein the location device is a Global Positioning Satellite location device or an ultrawideband radio frequency location device.

27. A sensor unit according to any one of the preceding claims, further comprising
an orientation sensor arranged to sense the orientation of the latch, the processor
being arranged to derive a latch orientation signal representing the orientation of the latch,
and
- 5 a wireless communication unit arranged to wirelessly communicate the tubular
monitor signal and the latch orientation signal.
28. A fingerboard latch fingerboard latch assembly comprising:
a latch bracket;
- 10 a latch rotatably supported on the latch bracket; and
a sensor unit according to any one of the preceding claims mounted on the latch.
29. A sensor unit for monitoring a piece of drilling equipment, the sensor unit
comprising:
- 15 a sensor configured to sense an adjacent piece of drilling equipment; and
a processor arranged to receive the output of the sensor and to generate an
equipment monitor signal representing the presence or absence and/or representing the
location of an adjacent piece of drilling equipment.