

CLAIMS

1. A location system for locating workers comprising:
a plurality of light detectors mounted at known locations and configured to detect
5 light from one or more workers; and
a processing system configured to determine locations of the workers using the
light detected by the light detectors.
2. A system according to claim 1, wherein the processing system is further configured
10 to determine if the location of one or more of the workers is within a defined area and
output a warning signal in response thereto.
3. A system according to claim 1 or 2, wherein the processing system is further
configured to control the activity of machinery based on the determined location of one or
15 more of the workers.
4. A system according to any one of the preceding claims, wherein the processing
system is configured to determine the locations of the workers using the light detected by
the light detectors by triangulation of light.
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5. A system according to any one of the preceding claims, wherein the light from the
workers is light reflected from the workers.
6. A system according to claim 5, wherein the system further comprises illuminating
25 light sources adjacent to respective light detectors, the light reflected from the workers
being light from the illuminating light source.
7. A system according to claim 6, wherein the illuminating light source outputs
modulated light.
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8. A system according to claim 7, wherein the illuminating light source is modulated
in intensity over time.

9. A system according to claim 8, wherein the light detectors are phase-locked to the illuminating light source.
- 5 10. A system according to any one of claims 5 to 9, wherein the system further comprises at least one reflective element to be mounted on respective workers, the light reflected from the workers being light reflected from the reflective element.
11. A system according to claim 10, wherein the at least one reflective element is
10 incorporated into items of personal protective equipment to be worn by respective workers.
12. A system according to claim 10, further comprising a wearable device to be worn by respective workers, the at least one reflective element mounted on the wearable device.
- 15 13. A system according to any one of claims 10 to 12, wherein the at least one reflective element comprises a retroreflector.
14. A system according to any one of claims 10 to 13, wherein the light reflected from the reflective element is modulated light.
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15. A system according to claim 14, wherein the modulated light is spatially modulated in intensity.
16. A system according to claim 13 or 14, wherein the modulated light encodes a
25 unique identifier.
17. A system according to any one of the preceding claims, further comprising wearable devices to be worn by respective workers, wherein the wearable devices each comprise a wearable device light source, the light from the workers being light from the
30 wearable device light source.
18. A system according to claim 17, wherein the wearable device light source outputs

modulated light.

19. A system according to claim 18 wherein the modulated light is modulated in intensity over time.

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20. A system according to claim 18 or 19, wherein the modulated light encodes a unique identifier.

21. A system according to any one of claims 18 to 20, wherein the light detectors are
10 phase-locked to the light source.

22. A system according to any one of the preceding claims, further comprising:
wearable devices to be worn by one or more of the workers who are authorised, the
wearable device including a wireless transceiver; and
15 a plurality of wireless receivers mounted at known locations and configured to
detect wireless signal transmissions from the wearable device,
the processing system being configured to determine locations of the authorised
workers using the wireless signal transmissions from the wearable device detected by the
wireless receivers.

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23. A system according to claim 22, wherein the wireless signal transmissions
comprise radio-frequency signal transmissions.

24. A system according to claim 23, wherein the processing system is configured to
25 determine the locations of the authorised workers using ultrawideband radio-frequency
location.

25. A system according to any one of claims 22 to 24, wherein the processing system is
configured to determine the locations of the authorised workers using the wireless signal
30 transmissions from the wearable device by triangulation of the wireless signal
transmissions.

26. A system according to any one of claims 22 to 25, wherein the processing system is configured to determine locations of the authorised workers by combining the locations of the authorised workers determined using the light detected by the light detectors and the locations of the authorised workers determined using the wireless signal transmissions
5 from the wearable device.

27. A system according to any one of claims 22 to 26, wherein the processing system is further configured to identify as unauthorised workers any workers whose location is determined using the light detected by the light detectors who are not authorised workers
10 whose location is determined using the wireless signal transmissions from the wearable device.

28. A system according to claim 27, wherein the processing system is configured to output a warning signal if the location of one or more of the workers identified as
15 unauthorised workers is within a defined area.

29. A system according to claim 27 or 28, wherein the processing system is configured to control the activity of machinery based on the location of the workers identified as unauthorised workers.

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30. A system according to any one of the preceding claims, wherein the processing system is further configured to determine locations of machinery using light from the machinery detected by the light detectors.

25 31. A system according to any one of the preceding claims, wherein the light from the machinery is light reflected from the machinery.

32. A system according to claim 31, wherein the system further comprises at least one reflective element to be mounted on the machinery, the light reflected from the machinery
30 being light reflected from the reflective element.

33. A system according to claim 32, wherein the at least one reflective element

comprises a retroreflector.

34. A system according to claim 32 or 33, wherein the light reflected from the reflective element is modulated light

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35. A system according to claim 34, wherein the modulated light is spatially modulated.

36. A system according to claim 34 or 35, wherein the modulated light encodes a unique identifier.

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37. A system according to any one of claims 30 to 36, further comprising mountable devices to be mounted on respective machinery, wherein the mountable devices each comprise a mountable device light source, the light from the machinery being light from the mountable device light source.

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38. A system according to any one of claims 30 to 37, further comprising:
mountable devices to be mounted on machinery which is authorised, the mountable device including a wireless transceiver; and

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a plurality of wireless receivers mounted at known locations and configured to detect wireless signal transmissions from the mountable device,

the processing system being configured to determine locations of the authorised machinery using the wireless signal transmissions from the mountable device detected by the wireless receivers.

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39. A system according to claim 38, wherein the processing system is further configured to identify as unauthorised machinery any machinery whose location is determined using the light detected by the light detectors which is not authorised machinery whose location is determined using the wireless signal transmissions from the mountable device.

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40. A system according to any one of claims 30 to 39, wherein the processing system is

further configured to compare the determined locations of workers to the determined locations of machinery.

41. A system according to claim 40, wherein the processing system is further
5 configured to output a warning signal and/or control the activity of machinery based on the comparison of the locations of workers and the locations of machinery.

42. A wearable device for locating a worker comprising:
a wireless transceiver; and
10 a wearable device light source and/or one or more reflective elements.

43. A wearable device according to claim 42, wherein the wearable device comprises a wearable device light source, and the wearable device light source outputs modulated light.

15 44. A wearable device according to claim 43, wherein the wearable device light source is modulated in intensity over time.

45. A wearable device according to claim 43 or 44, wherein the modulated light encodes a unique identifier.
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46. A wearable device according to any one of claims 42 to 45, wherein the wearable device comprises a reflective element and light reflected from the reflective element is modulated light, optionally wherein the modulated light is spatially modulated in intensity.

25 47. A wearable device according to claim 46, wherein the modulated light encodes a unique identifier.

48. A wearable device according to any one of claims 42 to 47, wherein the wearable device further comprises a power supply.
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49. A wearable device according to any one of claims 42 to 48, wherein the wearable device further comprises an accelerometer and/or a gyroscope.

50. A method for locating workers comprising:
- detecting light from one or more workers using a plurality of light detectors mounted at known locations; and
 - 5 determining locations of the workers using the light detected by the light detectors.