Claims

1. A hard hat with at least one integrated electronic subsystem, the hard hat comprising:

an outer portion;

an inner portion, wherein the outer and inner portions are spaced apart within the hard hat, and the at least one integrated electronic subsystem is mounted between the outer and inner portions; and

a plurality of battery coupling interfaces for coupling a plurality of removable batteries,

wherein the integrated electronic subsystem comprises a power subsystem configured to draw power from a coupled one of the plurality of removable batteries to enable exchange of another of the plurality of removable batteries without power loss to the integrated electronic subsystem, wherein the plurality of battery coupling interfaces are laterally mounted within the hard hat and wherein each of the plurality of battery coupling interfaces comprises:

a battery socket positioned between the inner and outer portion; and

a detachable casing portion to receive one of the plurality of removable batteries, the detachable casing portion being couplable to the hard hat around the battery socket to align the one removable battery with the battery socket.

2. The hard hat of claim 1, wherein the detachable battery casing comprises:

a mechanical interface for coupling with the hard hat, and

a securing mechanism to secure the removable battery within the detachable battery casing when the detachable battery casing is not coupled to the hard hat,

wherein the securing mechanism is arranged to release the removable battery when the detachable battery casing is coupled to the hard hat via the mechanical interface.

3. The hard hat of claim 2, wherein the securing mechanism comprises a gripping mechanism, the gripping mechanism comprising:

a pivoted member; and

a force applying member,

wherein, when the detachable battery casing is not coupled to the hard hat, the force applying member applies a force to a first end of the pivoted member to frictionally secure the removable battery within the detachable battery casing, and

wherein, when the detachable battery casing is coupled to the hard hat, the mechanical interface applies a counteracting force to a second end of the pivoted member to move the pivoted member to release the removable battery within the detachable battery case.

4. The hard hat of any one of the preceding claims, wherein the detachable battery casing further comprises:

a battery biasing member,

wherein, when the detachable battery casing is coupled to the hard hat, the battery biasing member applies a force to the removable battery to form an electrical connection between the removable battery and the integrated electronic subsystem of the hard hat.

5. The hard hat of any one of claims 1 to 4, wherein the plurality of battery coupling interfaces are laterally mounted such that, when the removable batteries are coupled to the hard hat, the centre of gravity of the hard hat is:

located below a circumferential rim of the hard hat;

located on or near a midline of the hard hat; and

located to the rear of the coupled removable batteries.

6. The hard hat of any one of the preceding claims, wherein the plurality of battery coupling interfaces allow removal of at least one of the plurality of removable batteries during use on the head of a user, wherein the detachable casing portion is removable with a single hand of the user.

7. The hard hat of any one of the preceding claims, wherein the integrated electronic subsystem comprises at least one processor and memory forming a compute module for an augmented reality system, wherein each detachable casing portion forms a lateral wing to a viewing assembly for the augmented reality system.

8. The hard hat of any one of the preceding claims, wherein the outer portion comprises a polymer outer shell having a first thickness and the inner portion comprises a carbon fibre inner shell having a second thickness, the second thickness being less than the first thickness.

9. The hard hat of claim 8, wherein the first thickness is around 1.5mm, the second thickness is around 0.8mm, and wherein the outer and inner portions are spaced by approximately 20mm for at least half of the circumference of the hard hat.

10. The hard hat of any one of the preceding claims, wherein a first integrated electronic subsystem is mounted upon one or more of the inner portion and the outer portion at a rear of the hard hat between the outer and inner portions, wherein the first integrated electronic subsystem comprises a fan and a spacing between the outer and inner portions allows an air flow over the first integrated electronic subsystem.

11. The hard hat of any one of the preceding claims, wherein the inner portion provides one or more of impact protection and penetration protection, and further comprising:

an impact foam arranged between the outer and inner portions.

12. The hard hat of any one of the preceding claims, wherein:

the inner portion comprises ventilation apertures, and

the hard hat further comprises:

a deformable ventilation coupling for coupling the outer portion and the inner portion, the deformable ventilation coupling allowing air flow from the ventilation apertures to an exterior of the outer portion.

13. The hard hat of claim 12, wherein the deformable ventilation coupling comprises a waterproof seal to prevent water entering the ventilation apertures, wherein the deformable ventilation coupling is attached to the outer portion and the inner portion, wherein the deformable ventilation coupling comprises:

a first rigid frame for coupling to the inner portion;

a second rigid frame for coupling to the outer portion; and

a deformable suspension system arranged between the first and second rigid frames,

where the deformable ventilation coupling comprises a rubber member and wherein the outer portion comprises air vents that are aligned with the deformable ventilation coupling in use.

14. The hard hat of any one of claims 1 to 13, comprising:

a cradle mounting;

a cradle for positioning the hard hat on a head of a user; and

a set of cradle mounting pins,

wherein the cradle comprises a plurality of spaced apertures that are adjustably alignable with corresponding apertures within the cradle mounting that receives the cradle, and

wherein the set of cradle mounting pins are removable to select different ones of the plurality of spaced apertures to adjust a relative height of the cradle compared to the cradle mounting for use.

15. The hard hat of claim 14, wherein the set of cradle mounting pins comprise quarter turn bayonet locking pins and wherein the cradle mounting pins comprise a foldable handle, the foldable handle having a position substantially normal to a face of each mounting pin to turn the pin.