

AN UNDERWATER CAMERA SYSTEM

Field of the Invention

5 [001] The present invention relates to an underwater camera system and in particular to an underwater wearable camera system or underwater handsfree camera system for use in gathering photographic imagery and/or data imagery in an underwater setting.

[002] The invention has been developed primarily for underwater usage by SCUBA divers in the depth of up to 200 metres but primarily in the 20 to 140 metre depths. The system
10 can be used up to about 500 metres from a tethered boat. However, it will be appreciated that the invention is not limited to this particular field of use and could be used by deep sea diving up to 500 metres.

Background of the Invention

15 [003] Underwater handsfree camera systems can be of various sizes and shapes and due to their configuration incur different problems.

[004] Generally they use copper wire systems. Since it is important to maintain safety with power in water the power is restricted to 12 volts. This substantially restricts distance from the remote operating station to about 50 metres due to power loss.

20 [005] Also the present systems have a light and camera. However it is necessary for the remote station to be advising the user of the effect of direction of the light to the captured visual image. This restricts the versatility and effective use of the known systems.

[006] It can be seen that known prior art underwater wearable camera system has the problems of:

- 25 a) Limitation of distance
- b) Not usable in deep water
- c) Requires large powered systems areas for deep use
- d) Not versatile or adaptable in user controlled use of camera and light.
- e) No integration of camera, light and power
- 30 f) Not usable hands free

g) Not usable without remote station control

[007] The present invention seeks to provide underwater wearable camera system, which will overcome or substantially ameliorate at least one or more of the deficiencies of the prior art, or to at least provide an alternative.

- 5 [008] It is to be understood that, if any prior art information is referred to herein, such reference does not constitute an admission that the information forms part of the common general knowledge in the art, in Australia or any other country.

Summary of the Invention

- 10 [009] The invention provides an underwater camera system comprising a camera system mountable on a diver and having a camera; and a light, a power system for powering the camera and the light; and a visual image capture system for capturing images by way of the camera and light. The system further can have an optical fibre and power line connecting the underwater wearable camera system on the diver to a remote station
15 providing for power and communication and visual image transfer therebetween wherein the power system is at least partially remote from the diver.

- [0010] The underwater camera system can include a tethered connection to at least a part of the remote station wherein the tethered remote station includes a boat on the water surface. This can allow the power system and the optical fibre to provide for a
20 distance of operation of up to 500 metres between the remote station and the tethered diver.

- [0011] The power system includes a supply at a higher transmission voltage than the safe low power in use voltage wherein the higher transmission power compensates for the energy loss caused by the distance of operation. Preferably the power system is a
25 DC system. More preferably the power system includes a storage on the tethered remote station at 12 volts and a step up transformation to a higher voltage for transmission and loss over the power line to the diver and a transformation at the diver to a usable 12 Volt system. The underwater camera system can advantageously have the higher transmission voltage is substantially at 48 Volts DC.

- 30 [0012] The underwater camera system can have the camera and the light mounted in a camera system body allowing coordinated focus of the camera and the light.

[0013] The system includes a mounting for mounting the camera system body to a helmet of the diver. The mounting for the camera system body to the helmet of the diver provides fixed relative focus relative to the viewing focus of the diver through the visor of the diver helmet. The mounting of the camera system body to the helmet is adjustable to
5 allow adjustment to a predetermined focus distance relative to the diver by adjusting the relative mounting angle of the camera and light relative to the forward direction of the diver's helmet.

[0014] The underwater camera system can preferably include a power system comprising a component of the power system with tether connection to wherein the tether
10 connection

[0015] Connections to the power line and optical fibre being through a transfer box mountable on the diver to allow free hand, arm and head movement to allow the diver to maintain common relative direction with the camera and light while maintaining common focus with the diver's view when the diver moves direction of the helmet.

[0016] The transfer box can be mountable on the rear of a diver's helmet wherein the diver has full and immediate control of directional control and maintained focus of camera, light, and diver's view.
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[0017] According to the present invention, there is provided in one form an underwater wearable camera system, comprising a camera system mountable on the diver's protective helmet and having: a camera; and a light; a power system for powering the camera and the light; and a visual image capture system for capturing images by way of
20 the camera and light; an optical fibre and power line connecting the underwater wearable camera system on the diver to a remote station providing for power and communication and visual image transfer therebetween wherein an umbilical cord tethers the diver to the remote station.
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[0018] The tethered remote station can be a boat on the water surface.

[0019] The power system and the optical fibre provide for a distance of operation of up to 500 metres between the remote station and the tethered diver. The power system can includes a supply at a higher transmission voltage than the safe low power in use
30 voltage wherein the higher transmission power compensates for the energy loss caused by the distance of operation. In one form the power system can includes a storage on the tethered remote station, such as the boat, at 12 volts and a step up transformation to a higher voltage for transmission and loss over the power line to the diver and a

transformation at the diver to a usable 12 Volt system. Preferably the higher transmission voltage is substantially at 48 Volts DC.

[0020] The underwater wearable camera system can have

- 5 a) a camera module having at least one body mountable on the side of the diver's helmet
- b) A diver connection module mountable at the rear of the diver's helmet to ensure balance and connectable to an umbilical cord connecting the diver to the tethered remote station
- 10 c) A camera module connection connecting the diver connection module to the camera module and closely following the perimeter of the diver's helmet to prevent fouling and snagging of the cord.

[0021] The mount on the helmet of the diver follows the movement of the user's head to direct the direction of the camera and the light.

15 [0022] Preferably the mount includes an adjustable bracket allowing the camera and light to substantially align with the user's line of sight. This allows the adjustment to be done prior to deployment as the screws will need to be tightened prior to use. Preferably the adjustable bracket of the mount allows an adjustment up to 20° left to right and can allow an adjustment up to 30° in elevation. Therefore the mount adjustable bracket allows the camera and light to substantially pre-aligned with the user's line of sight to a required
20 focus distance in the water.

[0023] An underwater wearable camera system according to claim 9 wherein the camera and the light are mounted in the camera module body in an adjacent and coplanar alignment to each other such that a single alteration of the camera module body to the forward viewing angle of the diver through a visor on the diver's helmet will alter the focus
25 of the light and the camera to a required focus length of the diver's view.

[0024] The underwater wearable camera system can include transmission of power, communication and camera control and image. The communication can include connection to sensors for providing to the remote station one or more of Depth, Pressure, Temperature, Salinity, Light metering, Depth of view, Light Dispersion. Water clarity, Diver
30 vital signs and Diver focus.

[0025] The invention also provides method of enabling an underwater wearable camera system for use in an extended distance from a tethered diver to a remote station including the steps of:

- a) Providing an underwater handsfree camera system mountable on the diver;
- 5 b) Providing a transmission system using fibre optic cabling;
- c) Providing a powering system using an increased power voltage for transmission and a low DC in use power by the underwater handsfree camera system on the diver.

This allows for the extended distance from a tethered diver to a remote station to be up
10 to 500 metres.

[0026] . The method of enabling an underwater wearable camera system can include the steps of:

- a) Mounting the camera and light of the underwater wearable camera system on the diver's helmet with fixed focus relative to the viewing focus of the diver through the
15 visor of the diver helmet
- b) Allowing adjustment to a predetermined focus distance relative to the diver by adjusting the relative mounting angle of the camera and light relative to the forward direction of the diver's helmet; and
- c) Allowing the diver to maintain common relative direction with the camera and light
20 while maintaining common focus with the diver's view when the diver moves direction of the helmet

Wherein the diver has full and immediate control of directional control and maintained focus of camera, light and diver's view.

[0027] The underwater handsfree camera system of the invention can allow for ready
25 operation of a camera system hands free and be maintained in a predetermined focus by the diver with full control of the camera, light with known camera image capture.

[0028] Other aspects of the invention are also disclosed.

Brief Description of the Drawings

[0029] Notwithstanding any other forms which may fall within the scope of the present invention, preferred embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 is a diagrammatic view of an underwater handsfree camera system in accordance with a preferred embodiment of the present invention showing a underwater handsfree camera system body connected to a diver who is tethered to a remote station being a boat;

10 Figs. 2 and 3 are front view and side exploded view of a camera module of the underwater handsfree camera system of Fig. 1 showing the camera and light;

Figs. 4 and 5 are front perspective view and overhead diagrammatic plan view of the mounting of the camera module on the diver's helmet and the relative orientation of the camera and light to the diver's forward view through the front visor of the diver's helmet to a predetermined focus length required in the use of the underwater handsfree camera system;

15 Figs. 6 and 7 are a diagrammatic front perspective view and an overhead plan view of the connection of the diver to the remote station of the boat in an operational connection of underwater handsfree camera system of Fig. 1;

20 Fig. 8 is a diagrammatic view of the operational connection between the boat and the diver by the fibre optic and umbilical cord of the underwater handsfree camera system of Fig. 1;

Fig. 9 is a diagrammatic view of the operational power connection between the boat and the diver by the fibre optic and umbilical cord of the underwater handsfree camera system of Fig. 1;

25 Fig. 10 is a diagrammatic view of the camera visual image connection between the boat and the diver by the fibre optic and umbilical cord of the underwater handsfree camera system of a first example of Fig. 1;

30 Fig. 11 is a diagrammatic view of the camera visual image connection between the boat and the diver by the fibre optic and umbilical cord of the underwater handsfree camera system of a second example of Fig. 1;

Fig. 12 is a diagrammatic view of a method of enabling an underwater wearable camera system in accordance with a preferred embodiment of the present invention by the steps of the connection in an extended distance from a tethered diver to a remote station;

- 5 Fig. 13 is a diagrammatic view of a method of enabling an underwater wearable camera system in accordance with a preferred embodiment of the present invention by the steps of undertaking the visual capture steps.

Description of Preferred Embodiments

- 10 [0030] It should be noted in the following description that like or the same reference numerals in different embodiments denote the same or similar features.

[0031] Referring to the drawings and particularly Figs. 1 to 7, there is shown an underwater wearable camera system comprising a camera module system 16 mountable on the diver's protective helmet 13 and having a camera 23 and a light 22 which is
15 mounted in a body 20 that is elongated to fit along the side of the helmet. The general cross section of the body 20 is tear drop so as to fit the larger cylindrical portion of the camera 23 in top section and the smaller cylindrical section of the light 22 below such that they are substantially coplanar. In this way the forward facing of the camera is relatively fixed to the forward direction of the light.

- 20 [0032] A power system 14 is fitted at the rear of the helmet 13 and connected to umbilical cord which tethers the diver to the remote station 11 for powering the camera and the light. An optical fibre and power line 12 connects the underwater wearable camera system on the diver to the remote station while a camera module connection 15 connects to the camera module 16, providing for power and communication and visual
25 image transfer therebetween.

[0033] As shown in Figs 2 and 3 the camera module 16 has the camera 23 and the light 22 in a camera module body 20. The lights are LEDs mounted in the body 16 on a powered circuit board 25 and covered at the front with a lens covering 26 and at the rear by a closing plate 21. The camera 23 is fitted in the adjacent cylindrical spacing mounted
30 in the body 16 on a powered board and covered at the front with a lens covering 29 and at the rear by a closing plate 21.

[0034] Creating of a water-proof housing that can handle deep waters and is also rugged to the tough conditions. The makeup of the device is the following:

- Thick, hard anodized aluminium housings
- O-ring seals
- 5 • Potted penetrators

[0035] It is important to keep the body size of the underwater handsfree camera system 11 with the underwater wearable camera system being substantially in the range of the size of the helmet of a SCUBA diver. In this way the buoyancy is readily maintained and the user is not hindered by a large attachment. Further the helmet with body is readily
10 moved by the user by simply moving their head and thereby the helmet and body.

[0036] Modularity

[0037] The system has been broken down into multiple modular components, allowing it to be adapted for specific conditions and applications. This also allows for possible future improvements to be easily integrated into a current model.

15 [0038] The three main constituent parts:

Remote station such as a boat 11 which can include a Boat box. The box placed on the boat, provides the interfacing of the camera unit with a host computer and interfacing with the power supply.

Diver connection module 14 is located at the back of diver's helmet. The diver connection
20 module includes a Splitter box. The high voltage transmission power and fibre optics come into the box from the boat 11 on the surface through the fibre optics 12 which can be integral with, attached to or coextending with the umbilical cord 12. Voltage is dropped, fibre optic signal is converted to USB, and the two are fed out to the camera module. Multiple other penetrator holes can be provided, to allow the addition of more lights or
25 cameras.

Camera module 16 sits on the side of the diver's helmet, in the same line of sight as the diver's vision.

[0039] Power Supply

[0040] Streaming over longer distances is achieved by use of fibre optic cabling. This
30 allows the length of operation to be extended far beyond anything available to traditional copper methods.

[0041] However, that distance therefore creates problems that need to be overcome. This includes the dramatic loss of power over distances, the functionality, and the importance in not hindering the user in an already dangerous location of 50 to 150 metres below the surface.

5 [0042] The electronics collects the data from the visual image capture and is connectable by connection 12 to transfer the data to a mother ship boat or remote station 11.

[0043] As the size of the underwater handsfree camera system does not generally provide sufficient space or weight to allow its own power source, it makes use of direct
10 current supply directly from the boat 11 to the diver.

[0044] Multiple power supplies are used:

- 12V to 48V step-up supply inside boat box
- 48V to 12V step-down, 48V to 5V step-down inside splitter box 14 in the diver connection module.

15 [0045] Boats, generally, are fitted with 12V batteries used for powering electrical circuits. The design allows for the 12V to be piped into the boat box and stepped up to a suitable voltage where the power losses through the 150m+ power cable underwater will be negligible. Roughly, we can expect about 3V-6V power loss through a 150m cable. Hence, the voltage available at the splitter box should sit at 42-48V.

20 [0046] 48V output of boat box 19 can be varied. 36V-48V output from boat box power supply will still provide sufficient power at the splitter box. I.e. At 36V output, after 150m we can expect to still have at least 30V. This is still a high enough voltage for the splitter box supplies to drop down to 12V and 5V.

[0047] As shown in Figs 6 and 7, the power system 14 for allowing the controllable
25 use of the underwater handsfree camera system body is connected by power line in the umbilical cord 12 to the boat 11. By location at the back of the helmet 13 it is readily balanced and wiring 15 to the camera is close to the helmet to thereby avoid or fouling or snagging of the lines 15 or umbilical cord 12.

[0048] Visual Image Capture System

30 [0049] Cameras can be either Stereoscopic or Monoscopic. Cameras are located in the camera module 16 attached to the diver's helmet 13. It is connected by a camera

alignment bracket 28 which is integral or attached to the mount of the camera body 16 mount.

[0050] The objective of camera placement is to make sure that the area of focus is about 2 metres from the camera. This is to ensure the best quality image is captured.
5 Although focus on 2 or less than 2 metres is planned the cameras will capture objects that are further away than 2 metres.

[0051] Further as shown in Figs 4 and 5, it is important to have the spacing of the cameras to the light and to the user's eyes. It is important that the location of the camera 23 is linked to the light 22 and the divers view are linked to each other to provide an
10 effective coordinated focused effect of the combination of the line of sight of the diver, along line , the camera, along line C, and the light, along line L.

[0052] However as per Fig 5 prior to entering the water the diver can select focus of the camera system including the camera 23 and the light 22. The adjustable bracket of the mount allows an adjustment up to 30° left to right and allows an adjustment up to 20°
15 in elevation. Focus can be selected at any one of F1, F2, F3 or F4 or there could be a mount that allows continuous focus at any position in this range/. Generally focus is at 2 metres. However due to the depth, the clarity and the need of the diver, this distance could be reduced or increased around this 2 metre distance. By preselecting the focus the camera module 16 with the camera 23 and light 22 can be focused relative to the view
20 of the diver along sightline E1 at the predetermine focal distance by adjustment of the angle R of the module 16 to the diver's helmet. This is facilitated by the camera alignment bracket 28 integral or attached to the camera module allowing change of By the camera and light being in fixed alignment in the module the adjustment to focus all three elements is simplified.

25 [0053] Further by the prefixed focus of the camera and light relative to the fixed focus is simply used by the movement of the diver's helmet. That is if the diver is focused two metres directly ahead, that same fixed two metre focus follows the divers head movement and is operative in the new direction of line of sight E of the diver (eg 45 degrees left). This eliminates the need to refocus the light the camera to the new direction.

30 [0054] Clearly a person skilled in the art would also see many other improvements that are novel and inventive and these are included in the scope of the invention

Interpretation

Embodiments:

[0055] Reference throughout this specification to “one embodiment” or “an embodiment” means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases “in one embodiment” or “in an embodiment” in various places throughout this specification are not necessarily all referring to the same embodiment but may. Furthermore, the particular features, structures or characteristics may be combined in any suitable manner, as would be apparent to one of ordinary skill in the art from this disclosure, in one or more embodiments.

[0056] Similarly it should be appreciated that in the above description of example embodiments of the invention, various features of the invention are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of one or more of the various inventive aspects. This method of disclosure, however, is not to be interpreted as reflecting an intention that the claimed invention requires more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive aspects lie in less than all features of a single foregoing disclosed embodiment. Thus, the claims following the Detailed Description of Specific Embodiments are hereby expressly incorporated into this Detailed Description of Specific Embodiments, with each claim standing on its own as a separate embodiment of this invention.

[0057] Furthermore, while some embodiments described herein include some but not other features included in other embodiments, combinations of features of different embodiments are meant to be within the scope of the invention, and form different embodiments, as would be understood by those in the art. For example, in the following claims, any of the claimed embodiments can be used in any combination.

Different Instances of Objects

[0058] As used herein, unless otherwise specified the use of the ordinal adjectives “first”, “second”, “third”, etc., to describe a common object, merely indicate that different instances of like objects are being referred to, and are not intended to imply that the objects so described must be in a given sequence, either temporally, spatially, in ranking, or in any other manner.

Specific Details

[0059] In the description provided herein, numerous specific details are set forth. However, it is understood that embodiments of the invention may be practiced without these specific details. In other instances, well-known methods, structures and techniques
5 have not been shown in detail in order not to obscure an understanding of this description.

Terminology

[0060] In describing the preferred embodiment of the invention illustrated in the drawings, specific terminology will be resorted to for the sake of clarity. However, the invention is not intended to be limited to the specific terms so selected, and it is to be
10 understood that each specific term includes all technical equivalents which operate in a similar manner to accomplish a similar technical purpose. Terms such as "forward", "rearward", "radially", "peripherally", "upwardly", "downwardly", and the like are used as words of convenience to provide reference points and are not to be construed as limiting terms.

15 Comprising and Including

[0061] In the claims which follow and in the preceding description of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprise" or variations such as "comprises" or "comprising" are used in an inclusive sense, i.e. to specify the presence of the stated features but not to
20 preclude the presence or addition of further features in various embodiments of the invention.

[0062] Any one of the terms: including or which includes or that includes as used herein is also an open term that also means including at least the elements/features that follow the term, but not excluding others. Thus, including is synonymous with and means
25 comprising.

Scope of Invention

[0063] Thus, while there has been described what are believed to be the preferred embodiments of the invention, those skilled in the art will recognize that other and further modifications may be made thereto without departing from the spirit of the invention, and
30 it is intended to claim all such changes and modifications as fall within the scope of the invention. For example, any formulas given above are merely representative of procedures that may be used. Functionality may be added or deleted from the block

diagrams and operations may be interchanged among functional blocks. Steps may be added or deleted to methods described within the scope of the present invention.

[0064] Although the invention has been described with reference to specific examples, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms.

[0065] “Camera” can mean a visual image camera or a camera that operates in a near visual image frequency range such as infra-red or ultraviolet.

[0066] “Image” can be a photographic image capturing visual image digitally or otherwise or an image in a near visual image frequency range such as infra-red or ultraviolet.

Industrial Applicability

[0067] It is apparent from the above, that the arrangements described are applicable to the underwater handsfree camera system and underwater wearable camera system industries.

Claims

The claims defining the invention are as follows:

1. An underwater camera system comprising:
 - a. a camera system mountable on a diver and having:
 - 5 i. a camera; and
 - ii. a light
 - b. a power system for powering the camera and the light; and
 - c. a visual image capture system for capturing images by way of the camera and light;
 - 10 d. an optical fibre and power line connecting the underwater wearable camera system on the diver to a remote station providing for power and communication and visual image transfer therebetween
2. An underwater camera system according to claim 1 wherein the power system is at least partially remote from the diver.
- 15 3. An underwater camera system according to claim 1 or 2 including a tethered connection to at least a part of the remote station wherein the tethered remote station includes a boat on the water surface.
4. An underwater camera system according to claim 1, 2 or 3 wherein the power system and the optical fibre provide for a distance of operation of up to 500 metres
20 between the remote station and the tethered diver.
5. An underwater camera system according to any one of the preceding claims wherein the power system includes a supply at a higher transmission voltage than the safe low power in use voltage wherein the higher transmission power compensates for the energy loss caused by the distance of operation.
- 25 6. An underwater camera system according to any one of the preceding claims wherein the power system is a DC system.
7. An underwater camera system according to any one of the preceding claims wherein the power system includes a storage on the tethered remote station at 12 volts and a step up transformation to a higher voltage for transmission and loss
30 over the power line to the diver and a transformation at the diver to a usable 12 Volt system.

8. An underwater camera system according to claim 7 wherein the higher transmission voltage is substantially at 48 Volts DC.
9. An underwater camera system according to any one of the preceding claims wherein the camera and the light are mounted in a camera system body allowing
5 coordinated focus of the camera and the light.
10. An underwater camera system according to any one of the preceding claims wherein the system includes a mounting for mounting the camera system body to a helmet of the diver.
11. An underwater camera system according to claim 10 wherein the mounting for the
10 camera system body to the helmet of the diver provides fixed relative focus relative to the viewing focus of the diver through the visor of the diver helmet
12. An underwater camera system according to claim 10 or 11 wherein the mounting of the camera system body to the helmet is adjustable to allow adjustment to a
15 predetermined focus distance relative to the diver by adjusting the relative mounting angle of the camera and light relative to the forward direction of the diver's helmet.
13. An underwater camera system according to claim 12 including a power system comprising a component of the power system with tether connection to wherein the tether connection
14. An underwater camera system according to claim 13 including connections to the
20 power line and optical fibre being through a transfer box mountable on the diver to allow free hand, arm and head movement to allow the diver to maintain common relative direction with the camera and light while maintaining common focus with the diver's view when the diver moves direction of the helmet.
15. An underwater camera system according to claim 14 including the transfer box
25 being mountable on the rear of a diver's helmet wherein the diver has full and immediate control of directional control and maintained focus of camera, light, and diver's view.
16. An underwater camera system according to any one of the preceding claims which is wearable by a diver including
30 a. A camera module having at least one body mountable on the side of the diver's helmet

- b. A diver connection module mountable at the rear of the diver's helmet to ensure balance and connectability to an umbilical cord connecting the diver to the tethered remote station
 - c. A camera module connection connecting the diver connection module to the camera module and closely following the perimeter of the diver's helmet to prevent fouling and snagging of the cable.
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17. An underwater wearable camera system comprising:
- a. a camera system mountable on the diver's protective helmet and having:
 - i. a camera; and
 - ii. a light
 - b. a power system for powering the camera and the light; and
 - c. a visual image capture system for capturing images by way of the camera and light;
 - d. an optical fibre and power line connecting the underwater wearable camera system on the diver to a remote station providing for power and communication and visual image transfer therebetween
 - e. wherein an umbilical cord tethers the diver to the remote station.
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- 15
18. An underwater wearable camera system according to claim 17 wherein the tethered remote station is a boat on the water surface.
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19. An underwater wearable camera system according to claim 17 wherein the power system and the optical fibre provide for a distance of operation of up to 500 metres between the remote station and the tethered diver.
20. An underwater wearable camera system according to claim 17 wherein the power system includes a supply at a higher transmission voltage than the safe low power in use voltage wherein the higher transmission power compensates for the energy loss caused by the distance of operation.
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21. An underwater wearable camera system according to claim 17 wherein the power system is a DC system.
22. An underwater wearable camera system according to claim 17 wherein the power system includes a storage on the tethered remote station at 12 volts and a step up
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transformation to a higher voltage for transmission and loss over the power line to the diver and a transformation at the diver to a usable 12 Volt system.

23. An underwater wearable camera system according to claim 17 wherein the higher transmission voltage is substantially at 48 Volts DC.

5 24. An underwater wearable camera system according to claim 17 including

- a. A camera module having at least one body mountable on the side of the diver's helmet
- b. A diver connection module mountable at the rear of the diver's helmet to ensure balance and connectability to an umbilical cord connecting the diver to the tethered remote station
- 10 c. A camera module connection connecting the diver connection module to the camera module and closely following the perimeter of the diver's helmet to prevent fouling and snagging of the cable.

15 25. An underwater wearable camera system according to claim 24 including a mount on the helmet of the diver wherein the body is mountable on the helmet of the user wherein the movement of the user's head directs the direction of the camera.

26. An underwater wearable camera system according to claim 25 wherein the mount includes an adjustable bracket allowing the camera and light to substantially align with the user's line of sight.

20 27. An underwater wearable camera system according to claim 25 wherein the adjustable bracket of the mount allows an adjustment up to 30° left to right.

28. An underwater wearable camera system according to claim 25 wherein the adjustable bracket of the mount allows an adjustment up to 20° in elevation.

25 29. An underwater wearable camera system according to any one of claims 25 to 28 wherein the mount includes an adjustable bracket allowing the camera and light to substantially pre-align with the user's line of sight to a required focus distance in the water.

30 30. An underwater wearable camera system according to claim 25 wherein the camera and the light are mounted in the camera module body in an adjacent and coplanar alignment to each other such that a single alteration of the camera module body to the forward viewing angle of the diver through a visor on the diver's helmet will

alter the focus of the light and the camera to a required focus length of the diver's view.

31. An underwater wearable camera system according to claim 17 wherein the front transparent panel of the body has a lens effect.

5 32. An underwater wearable camera system according to claim 17 wherein the system includes transmission of power, communication and camera control and image.

33. An underwater wearable camera system according to any one of the preceding claims wherein the communication can include connection to sensors for providing to the remote station one or more of:

- 10 a. DepthTemperature
 b. Salinity
 c. Pressure
 d. Light metering
 e. Depth of view
15 f. Light Dispersion
 g. Water clarity
 h. Diver vital signs
 i. Diver focus.

20 34. A method of enabling an underwater wearable camera system for use in an extended distance from a tethered diver to a remote station including the steps of:

- a. Providing an underwater handsfree camera system mountable on the diver;
 b. Providing a transmission system using fibre optic cabling;
 c. Providing a powering system using an increased power voltage for transmission and a low DC in use power by the underwater handsfree
25 camera system on the diver.

35. A method according to claim 34 wherein the extended distance from a tethered diver to a remote station is up to 500 metres.

36. A method of enabling an underwater wearable camera system according to claim 34 or 35 wherein the undertaking of visual capture includes the steps of:

- a. Mounting the camera and light of the underwater wearable camera system on the diver's helmet with fixed relative focus relative to the viewing focus of the diver through the visor of the diver helmet
 - b. Allowing adjustment to a predetermined focus distance relative to the diver by adjusting the relative mounting angle of the camera and light relative to the forward direction of the diver's helmet; and
 - c. Allowing the diver to maintain common relative direction with the camera and light while maintaining common focus with the diver's view when the diver moves direction of the helmet
- 10 wherein the diver has full and immediate control of directional control and maintained focus of camera, light, and diver's view.