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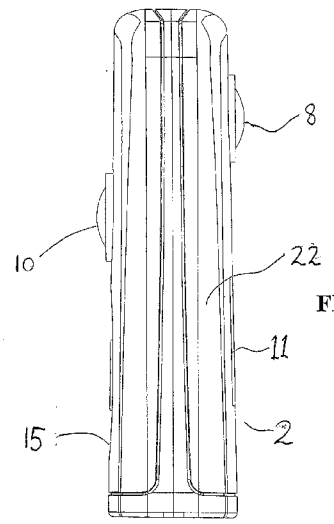


FIGURE 1

(57) Abstract: An imaging system comprising one or more imaging devices wherein each device comprises a lens or lenses which together form an array of lens wherein: the array includes two lenses; the two lenses face in opposing directions; the axes of the two lenses are substantially parallel; and the system is adapted to simultaneously capture and record images from the two lenses.

IMAGING SYSTEMS

Field of the Invention

The invention relates to imaging systems and devices for capturing images.

Background

An effective rowing stroke is a combination of athleticism, skill and technique. Developing technique takes time and practice. One recognised problem in developing a better technique is the inability of a rower to remotely view their own stroke and identify and observe any inadequacies. This same issue exists for a rowing coach when communicating to the crew subtle observations and the modifications that are required.

The present invention seeks to at least partly mitigate this problem. The systems and devices of this invention may also be useful in other sports and areas, such as forensics.

Summary of the Invention

According to one aspect of the present invention there is provided an imaging system comprising one or more imaging devices wherein each device comprises a lens or lenses which together form an array of lens wherein:

the array includes two lenses;

the two lenses face in opposing directions;

the axes of the two lenses are substantially parallel; and

the system is adapted to simultaneously capture and record images from the two lenses.

According to another aspect of the present invention there is provided an imaging device an array of lenses mounted to the device wherein,

the array includes two lenses;

the two lenses face in opposing directions;

the axes of the two lens are substantially parallel; and

the device is adapted to simultaneously capture images from the two lenses.

According to a still further aspect of the present invention, there is provided a system for capturing images of a rower's stroke while rowing in a rowing apparatus comprising an imaging device, wherein:

the imaging device is fixed relative to the apparatus; and

the imaging device is fixed substantially at or above the pivot point of the rower's oar, or in a position simulating the location of the pivot point of a rower's oar, for recording images of the rower and/or the rower's oar.

Brief Description of the Drawings

In order that the invention may be more easily understood, embodiments will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1: is a side view of a camera in a first embodiment of the invention,

Figure 2: is a perspective view of an inner face of the camera,

Figure 3: is a front view of an outer face of the camera,

Figure 4: is a general layout of a system for rowing training including the camera,

Figure 5: is a front view of the camera fitted to a mount,

Figure 6: is a perspective view of the mount for the camera,

Figure 7: is a perspective view of a camera in accordance with a second embodiment of the invention,

Figure 8: is a general layout of cameras in the second embodiment of the invention,

Figure 9: is a perspective view of part of a rowing boat unoccupied illustrating the mounting of a camera,

Figure 10: is a perspective view of part of a rowing boat showing the relationship of a rower with cameras mounted on either side of the rower,

Figures 11a, b, c: show side views of the stroke of a rower,

Figures 11d, e, f: show plan views of the stroke of the rower,

Figures 12a, b, c: show the stroke of the rower as viewed from a camera mounted on the centre line of the boat; and

Figure 13: shows a camera mounted on the centre line of the stern of the boat.

Description of the Embodiments

A first embodiment of the invention is shown in Figures 1 to 6. In this embodiment, an imaging device (a camera 2) is specifically adapted for use in coaching sports, particularly rowing.

The camera has two lenses 8, 10 mounted to a single body 22. The two lenses 8, 10 face in opposing directions. Each lens has an axis passing transversely through its centre. The axes of the two lenses are parallel. The device is adapted to simultaneously capture images from both lenses.

In this embodiment both lens are housed in a single device. However, it is understood that each lens could be housed in a separate device. For example, two devices could be mounted back to back with one lens in each device. Such a combination of devices is referred to as a "system" which is adapted to simultaneously capture images from both the first and second lenses even though they are in different devices.

Figure 1 shows the camera 2 having two lenses which face in opposite directions, fixed to a single camera body 22. One lens is, relative to the boat, an outward facing lens 10 and the other an inward facing lens 8. The camera 2 is able to record and synchronise images from both lenses at the same time. The camera 2 can simultaneously record still or video images in two different directions from the same perspective.

Each lens focuses on an image sensor located inside the camera body 22. The inward facing lens 8 is mounted slightly higher in the body 22 than the outer lens 10. The axes of the two lenses are offset to allow a more compact camera body, and to match the perspective of each image. If they were back to back the body 22 would potentially need to be wider. The two image sensors are coupled to an image processor which receives data from the image sensors and can encode it for storage. The camera incorporates a digital memory for storing the image and video data. A battery mounted inside the body 22 powers the camera, the battery can be recharged using electrical connectors located on the bottom of the camera.

The processor and image sensors are capable of recording video at frame rates in excess of 100 frames/sec from both viewpoints. A wired, or wireless, interface allows data stored in the memory to be transferred to another device, such as a computer, for playback, analysis, or permanent storage.

Figure 2 shows an inner face 11 of the camera 2. The inward facing lens 8 is located on this face. The inner face 11 also includes an display screen 12, which provides

the user with a Graphical User Interface (GUI) to the device. The GUI includes a menu structure that allows options, including deleting and transmitting data from the memory of the camera, as well as starting and stopping recording.

On the outer face 15, shown in Figure 3, the camera has a round 'touch' interface 14. The interface can be used to operate the GUI on the display screen 12. Sensors behind the surface of the interface 14 detect the presence of a user's finger on the surface of the interface. The user can move their finger in a rotational pattern around the interface 14 to scroll through and select various options on the GUI.

The camera 2 has a sealed, waterproof body 22 to facilitate operation in exposed and wet environments.

One application of this embodiment is as part of a coaching system which is illustrated in Figure 4; this application may require the use of several cameras 2. Figure 9 shows an unoccupied boat 6 with cameras 2 mounted on oars 5 extending from both sides of the boat. Figure 10 illustrates a boat with a rower and a pair of cameras 2 mounted outboard of each side of the boat with lens facing towards the rower. Both cameras 2 are mounted on the oar rigger 4 to be fixed relative to the boat.

The system is used for capturing images of a rower's stroke while in a rowing boat 6, rowing simulator, rowing device or an exercise machine . The cameras 2 are fixed relative to the rowing apparatus. In the case where the device is mounted on a rowing boat 6, each camera 2 is

fixed at the pivot point of each rower's oar 5 for recording a side elevation view of a stroke of the rower and the rower's oar simultaneously.

To obtain the side elevation view of the stroke of the rower and the rower's oar 5, each camera 2 is mounted on the oar's rigger 4 of the rowing boat 6. The cameras are mounted near to the fulcrum of the oar 5. When mounted, the inward facing lens 8 of the camera faces into the boat and can be used to record the rower's rowing action from a side elevation view. The outward facing lens 10 faces toward the oar's movement arc 7, and can be used to record the action of the oar. The cameras 2 are fixed relative to the boat 6 and they do not rotate as the oar moves through its arc and the rower's body rocks back and forth during the stroke.

By recording both the action of the rower and the oar the camera 2 provides an improved visual record of the stroke that could not be achieved with a single lens camera.

Figures 11a, b, c, d, e and f illustrate the stroke of a rower viewed from the side and from above. It should be noted that the camera 2 does not move relative to the boat during the rower's stroke.

From the coach and rower's perspective this record of the stroke plays an important training role. The recording provides an important view of the rowing action which can be used as a basis for further training and improvement.

From the coach's perspective, the camera 2 plays an important role. It can be difficult to describe in words

what problems exist in a rower's stoke. The recording provides a basis to clearly identify problems and suggest solutions. Being able to record both the action of the rower and the oar tip in synchronisation is significantly advantageous to the coach. For example, if the tip is clearly leaving the water too late (shown in the recording from the outward facing lens 10) the coach can point specifically to which part of the rower's action (recorded by the inward facing lens 8) is causing this problem.

Figure 5 shows the camera 2 fitted onto a mount 16 which can be bolted to the rigger 4 of the boat 6. Figure 5 shows a perspective view of the mount. The camera locks onto magnets 18 in the mount. Alignment with the mount is achieved by way of a spigot 20 in the mount. The magnets 18, allow the camera to be easily removed from the mount for the purposes of downloading the recorded data, recharging a battery in the camera, and for storage and security.

The mount can be bolted to the rigger 4 using a bolt assembly 24. As the mount is permanently fixed to the rigger 4 the camera will align to the same angle each time it is fitted to the mount 16. Thus, the lens of the camera 2 will capture the same perspective, from the same direction each time the camera is fitted to the mount 16. This will ensure the camera 2 always captures a full view of the rower and oar tip without any adjustment each time it is fitted to the boat 6, and that all future images will be able to be overlayed on previous images for direct comparison.

As shown in Figure 4, a set of cameras 2 can be mounted on the same boat 6 to record several rowers. The images recorded by each lens are accurately synchronised and time stamped when recorded. The time data used to stamp the image data could be determined in number of ways:

- Each camera could include its own clock.
- Each camera could include a GPS module and an antenna, and receive accurate time data from a GPS satellite
- A single clock could transmit accurate time data either wirelessesly or over a network of wires to each camera on the boat.

Single or dual lens cameras 2 can be positioned on the centre line of the boat as shown in Figure 13. It is understood that cameras 2 can be placed on the deck of the vessel between rowers to produce the images of the rower's stroke shown in Figures 12a, b and c.

The cameras 2 are adapted to transmit recorded data wirelessly to a computer 32. The data is recorded on the computer for later playback on a monitor 36. Thus, once a training session is complete, playback can be activated without having to remove the cameras 2 from the boat 6 or physically wiring them to the computer 32.

Coordination of the stroke's segment timing and length between different crew members is critical to developing a balanced boat and a successful rowing crew. However, it can be difficult for each crew member to determine if he/she is "in time", particularly while he/she simultaneously concentrates on his/her own rowing stroke.

The various time-stamped recordings can be played back simultaneously to give rowers an accurate perception of their own timing relative to the rest of the crew. For example, the image of each rower's oar tip captured by the outward facing lens 10 could be played back in various viewing panes on the monitor 36 to demonstrate any timing issues.

Alternatively, the various images could be superimposed on each other 36 to more fully demonstrate timing problems. The recordings from the inward facing lens 8 (the recording of the rower's action) can also be superimposed or compared in separate frames on the monitor 36. When superimposing the images the oars or rowers could be shaded in different colours to demarcate each rower in the team. Thus, any rowers who were not in sync with the rest of the team can be easily identified.

The high frame capture rate allows the coach or rower to play back the recording at slow speeds and accurately determine the timing of each part of the rowing action.

The cameras are mounted so as to capture the full range of the rowing stroke, from the 'catch' position shown in Figures 11a and 11d to the 'finish' position shown in Figures 11c and 11f. Figures 12a, b and c show three still frames from the video as it appears in a piece of software which forms part of the training system, along with the cameras.

The software allows a user to mark on screen the various 'points' of the stoke at various times. For example, the

user could mark the point at which the oar enters the water at the start of the drive. The user could then mark the point at which the oar leaves the water at the finish of the drive. By marking these two points at least two calculations can be made:

- The 'drive' time, by establishing the time elapsed between the frames.
- The 'drive' angle; that is the angle swept by the oar during the drive.

It is understood that, by marking various points on the video frames, a wide variety of data could be established, for example, to determine if a rower is improving or if rowers are in time with one another. The following could be calculated:

- the swept angle 'lost' at each end of the stroke;
- the travel of the seat during each stroke;
- the angle formed between the rowers upper and lower leg at the catch position.

It is understood that the above measurements and many others could assist a coach in selecting and training rowers. They would also be useful to the rower in monitoring and understanding his/her own stroke. The camera is fixed relative to the boat such that calculations can be easily performed by marking points on the frames of the video.

The software may include the capability to automatically recognise and measure the various parts of the stroke without the user having to mark the various points.

The rower may wear highlighted tabs on their clothing. These tabs could be reflective, or simply be coloured to contrast with the rower's clothing. Such tabs will assist the user to mark the required points on the frames so as to asses the stroke. The tabs could also assist the software in recognising and automatically marking these same points on the stroke.

This embodiment includes a recording device (not shown) located within the boat. This device includes a multi axis gyroscope and an 3D accelerometer. The gyroscope measures the roll, pitch and yaw of the boat about its primary longitudinal axis. The accelerometer measures the boat acceleration.

This embodiment also includes a remote control 34, which can be used by the coach. The control 34 can be used to start and stop recording by the various cameras 2, and to re-configure the cameras parameters. The remote control allows the coach to capture particular strokes or parts of session they feel need review during the debriefing session. The camera devices contain a circular memory which provides the user with the ability to post-trigger the capture point of a particular event after it has occurred.

The cameras 2 can also be used in conjunction with a load or strain gauge 38 which is also mounted to the rigger 4. The gauge measures the amount of force applied by the oar 7 to the rigger 4. The gauge 38 thus monitors each stroke's force profile. The gauge 38 is in wired or wireless communication with the camera 2. The data from the gauge 38 is transferred to the camera where it is

stored in the memory alongside each image frame of the rowing strokes. Thus, during playback and debriefing the coach and rower have access to this data as well as the images. This data can be displayed visually on the monitor 36 alongside the stroke recording to assist in critiquing and providing the rower with feedback on their technique. For example, the force measured on the strain gauge 38 can be shown on a graph alongside the video of the rower or the oar.

As discussed above, the system could include two separate imaging devices mounted back to back, one monitoring the oar, the other the rower. However, it is expedient that a single device can record images in both directions.

The same cameras 2 can also be fixed to rowing training machine, or other rowing apparatus, to record the stroke of a rower during training. Where the machine is a flywheel type machine, there is no oar, and a single lens could be used to record only the rower.

A second embodiment of the invention is shown in Figures 7 and 8. In this embodiment, a hexagonal camera 50 is specifically adapted for use in forensic applications. The camera can be used to capture a still or video record of a crime scene.

The hexagonal camera 50 has a total of seven lenses each capable of recording images at different angles from substantially the same perspective. Six side lenses 52 are located on the side walls 54 of the camera. A top lens 56 faces upwards.

The side lenses 52 are made up of three pairs of opposing lenses, which not only have parallel axes, but by virtue of the fact that they are directly opposite each other, share the *same* axis.

A problem which can arise in photographing a crime scene is that the photographer will subjectively capture images they perceive to be important at the time. However, as the investigation proceeds a record of any number of other perspectives or angles of the scene may become vital to determining what happened at the scene.

This embodiment provides means for simultaneously recording an array of different perspectives and angles quickly and without the subjective bias of a photographer. The hexagonal camera 50 (an imaging device) can be set up to gather a breadth of visual data before evidence begins to degrade.

As in the first embodiment the camera comprises a image sensor located behind each lens, as well as a processor and digital memory. Images can be recorded simultaneously from all image sensors. Each image is recorded with two pieces of data, the time it was taken and the location from which it was taken.

Figure 8 shows one application of this hexagonal camera 50. In this application the hexagonal camera 50 is used in combination with six dual lens cameras 60 which are also used to record images at a crime scene. The dual lens cameras 60 have an inward facing lens 62 and an outward facing lens 64. Each camera is mounted on a

telescopic stand 66 to enable, if desired, matching of their image planes.

The hexagonal camera 50 is placed in a central location at the scene and uses various lenses to record in multiple different directions (including upwards) at one time. The dual lens cameras 60 are placed in a ring around the camera 50. The inward facing lenses 62 of each dual lens camera 60 are directed toward the hexagonal camera 50. The outward facing lens 64 record images radially outward from the circle.

This embodiment provides an extensive visual record of a crime scene. Importantly, images are taken without a subjective bias. No particular perspective or angle is given precedence over another. If desired, the various images can be used to reconstruct a multi-dimensional model of the scene during the investigation that follows.

Importantly, the recordings are time stamped. Thus, the investigator can easily ascertain what was occurring in two or more parts of the crime scene at the same time.

The hexagonal camera 50 can also be used in a dynamic rather than static fashion. For example, a user can hold the hexagonal camera 50 in their hand and walk in a circle, circumnavigating the scene. The multiple lenses 52 and 56 can thus capture images both toward the centre of the circle and also outwards from the circle. Such extensive visual information provides a useful record of the scene.

The images captured by this camera provide a rich pool of data from the array of lenses. The value of this data is increased by having a fixed relationship between the opposing lens pairs. One can view an image from a first lens in a pair and compare or contrast it with an image taken in an opposite direction at the same time, and from the same perspective.

Throughout this specification, except where the context requires otherwise due to express language or necessary implication, the word "comprise" or variations such as "comprises" or "comprising" is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the invention.

It will be understood to persons skilled in the art of the invention that many modifications may be made without departing from the spirit and scope of the invention.

CLAIMS:

1. An imaging system comprising one or more imaging devices wherein each device comprises a lens or lenses which together form an array of lens wherein:

the array includes two lenses;

the two lenses face in opposing directions;

the axes of the two lenses are substantially parallel; and

the system is adapted to simultaneously capture and record images from the two lenses.

2. An imaging system according to claim 1, wherein the two lenses share the same axis.

3. An imaging system according to either preceding claim wherein the array further comprises a third lens and a fourth lens wherein:

the third and fourth lenses face in opposing directions;

the axis of the third and fourth lenses are substantially parallel;

the system is adapted to simultaneously capture and record images from all four lenses.

4. An imaging system according to any one of the preceding claims wherein the field of view of each lens in the array does not substantially overlap with the field of view of any other lens in the array.

5. An imaging system according to any one of the preceding claims wherein the field of view of each lens in

the array does not overlap with the field of view of any other lens in the array.

6. An imaging device an array of lenses mounted to the device wherein,

the array includes two lenses;

the two lenses face in opposing directions;

the axes of the two lens are substantially parallel; and

the device is adapted to simultaneously capture images from the two lenses.

7. An imaging device according to claim 6, wherein the two lenses share the same axis.

8. An imaging device according to claim 6 or 7 comprising a third lens and a fourth lens wherein:

the third and fourth lenses face in opposing directions;

the axes of the third and fourth lenses are substantially parallel;

the device is adapted to simultaneously capture and record images from all four lens.

9. An imaging device according to any one of claims 6 to 8 wherein the field of view of each lens in the array does not substantially overlap with the field of view of any other lens in the array.

10. An imaging device according to any one of claims 6 to 9 wherein the field of view of each lens in the array does not overlap with the field of view of any other lens in the array.

11. A system for capturing images of a rower's stroke while rowing in a rowing apparatus comprising an imaging device in accordance with any one of claims 6 to 10, wherein the imaging device is fixed relative to the apparatus for recording images of the rower and/or the rower's oar.

12. A system for capturing images of a rower's stroke in accordance with claim 11 wherein the imaging device is fixed substantially at or above a pivot point of the rower's oar for recording side elevation view images of the rower and the rower's oar.

13. A system for capturing images of a rower's stroke in accordance with claim 11 or 12 wherein the apparatus is a rowing boat and the imaging device is fixed in a position substantially on a centreline of the boat such that the lens in the array captures images of the front or back of the rower.

14. A system for capturing images of a rower's stroke in accordance with claim 13 wherein at least one single lens camera positioned on the centre line is used in conjunction with cameras mounted on the riggers.

15. A system for capturing images of a rower's stroke while rowing in a rowing apparatus comprising an imaging device, wherein:

the imaging device is fixed relative to the apparatus; and

the imaging device is fixed substantially at or above the pivot point of the rower's oar, or in a position

simulating the location of the pivot point of a rower's oar, for recording images of the rower and/or the rower's oar.

16. A system for capturing images of a rower's stroke in accordance with claims 11 to 15, wherein the rowing apparatus is a rowing boat.

17. A system for capturing images of a rower's stroke in accordance with claim 15, wherein the rowing apparatus is a rowing training machine.

18. A system for capturing images of a rower's stroke in accordance with any one of claims 15 to 17, wherein the imaging device is fixed directly or indirectly to an oar's rigger location.

19. A system for capturing images of a rower's stroke in accordance with any one of claims 15 to 18, wherein the imaging device comprises a body and an array of lenses mounted to the body wherein the lenses are mounted to the body and the device is adapted to simultaneously capture images from two or more of said lenses.

20. A system for capturing images of a rower's stroke in accordance with any one of claims 15 to 19, wherein the array is made up of only two lenses and the lenses are fixed in position, and face in substantially opposing directions.

21. A system for capturing images of a rower's stroke in accordance with any one of claims 15 to 20, wherein the

imaging device is adapted to releasably fit to a mount fixed to the rigger.

22. A system for capturing images of a rower's stroke in accordance claim 21, wherein the imaging device is fitted to the mount using a magnet.

23. A system for capturing images of a rower's stroke in accordance with in one of claims 12 to 22, wherein the imaging device comprises a display screen and/or user interface.

24. A system for capturing images of a rower's stroke in accordance with any one of claims 15 to 23, wherein the imaging device is sealed to prevent ingress of water.

25. A system for capturing images of a rower's stroke in accordance with any one of claims 15 to 24, wherein the imaging device is adapted to capture and record images at a frame rate of, or higher than, 100 frames per second.

26. A system for capturing images of a rower's stroke in accordance with any one of claims 15 to 25, wherein the imaging device is adapted to record both images and data indicative of the time that the images are captured.

27. A system for capturing images of a rower's stroke in accordance with claim 26, wherein the imaging device including means for receiving time data from a satellite wherein the received time data is used as the basis for recording the time that images are captured.

28. A system for capturing images of a rower's stroke in accordance with claim 26, wherein the system comprises several imaging devices and a clock wherein time data is transmitted from the clock by wires or wirelessly to the imaging devices and used as the basis for recording the time that images are captured.

29. A system for capturing images of a rower's stroke in accordance with any one of claims 15 to 28, wherein the imaging device is adapted to transmit recorded data wirelessly.

30. A system for capturing images of a rower's stroke in accordance with any one of claims 15 to 29, comprising a remote control for starting and stopping recording by the imaging device.

31. A system for capturing images of a rower's stroke in accordance with any one of claims 15 to 30, comprising more than one imaging device fixed to the same apparatus.

32. A coaching method comprising:

recording video footage of the stroke of a rower and/or an oar using an imaging system in accordance with any one of claims 15 to 31; and

assessing the rower's stroke using the recorded video.

33. A coaching method in accordance with claim 32 wherein the assessment include measurement of any one of:

Stroke length, stroke angle, stroke duration, stroke slip, stroke segment delay, leg compression, longitudinal

body angle, lateral body angle and variation in technique derived by image matching overlay.

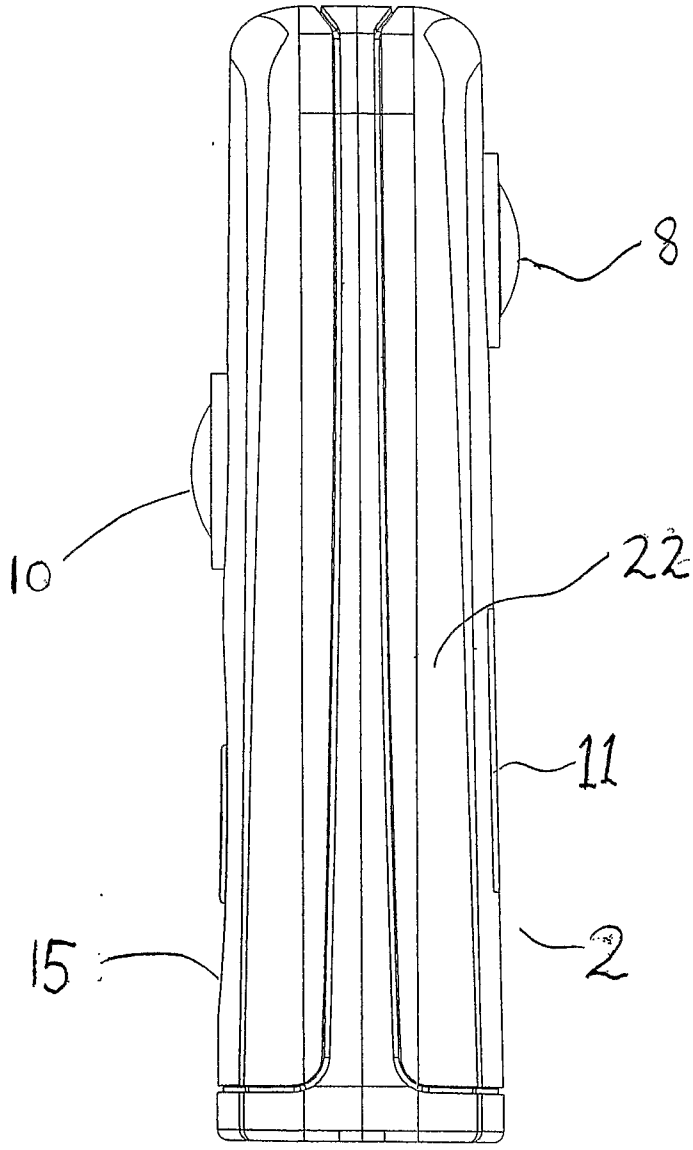


FIGURE 1

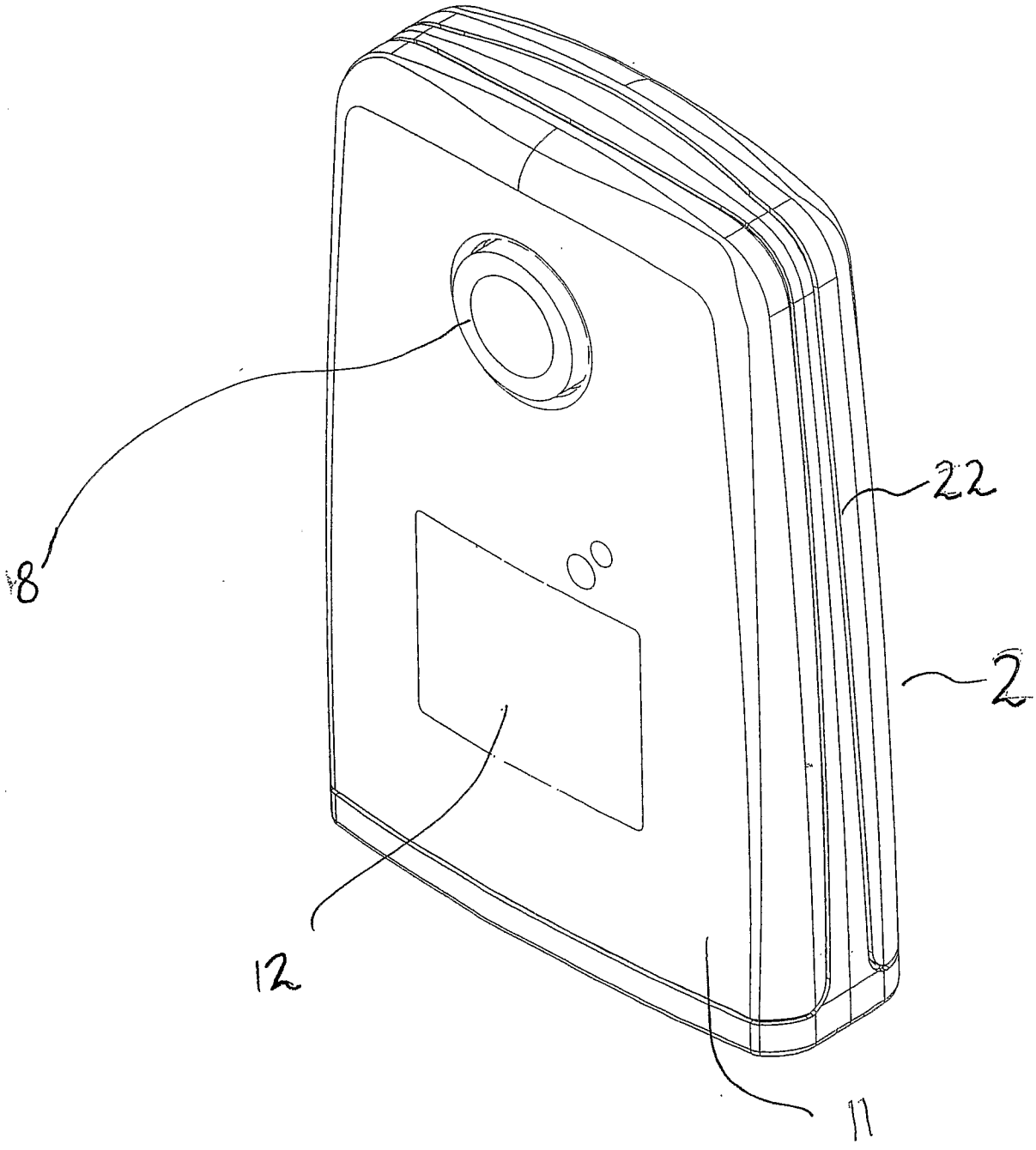


FIGURE 2

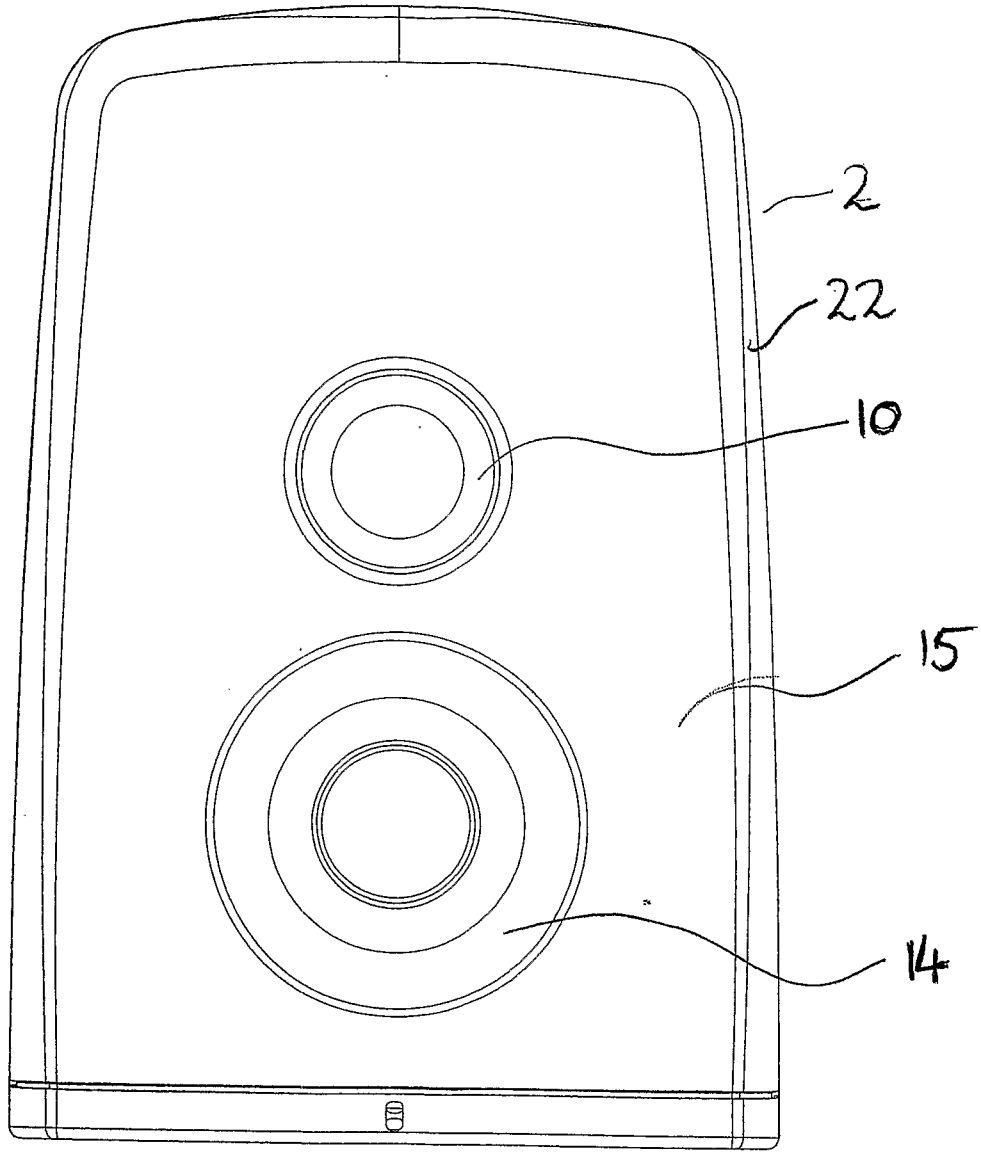


FIGURE 3

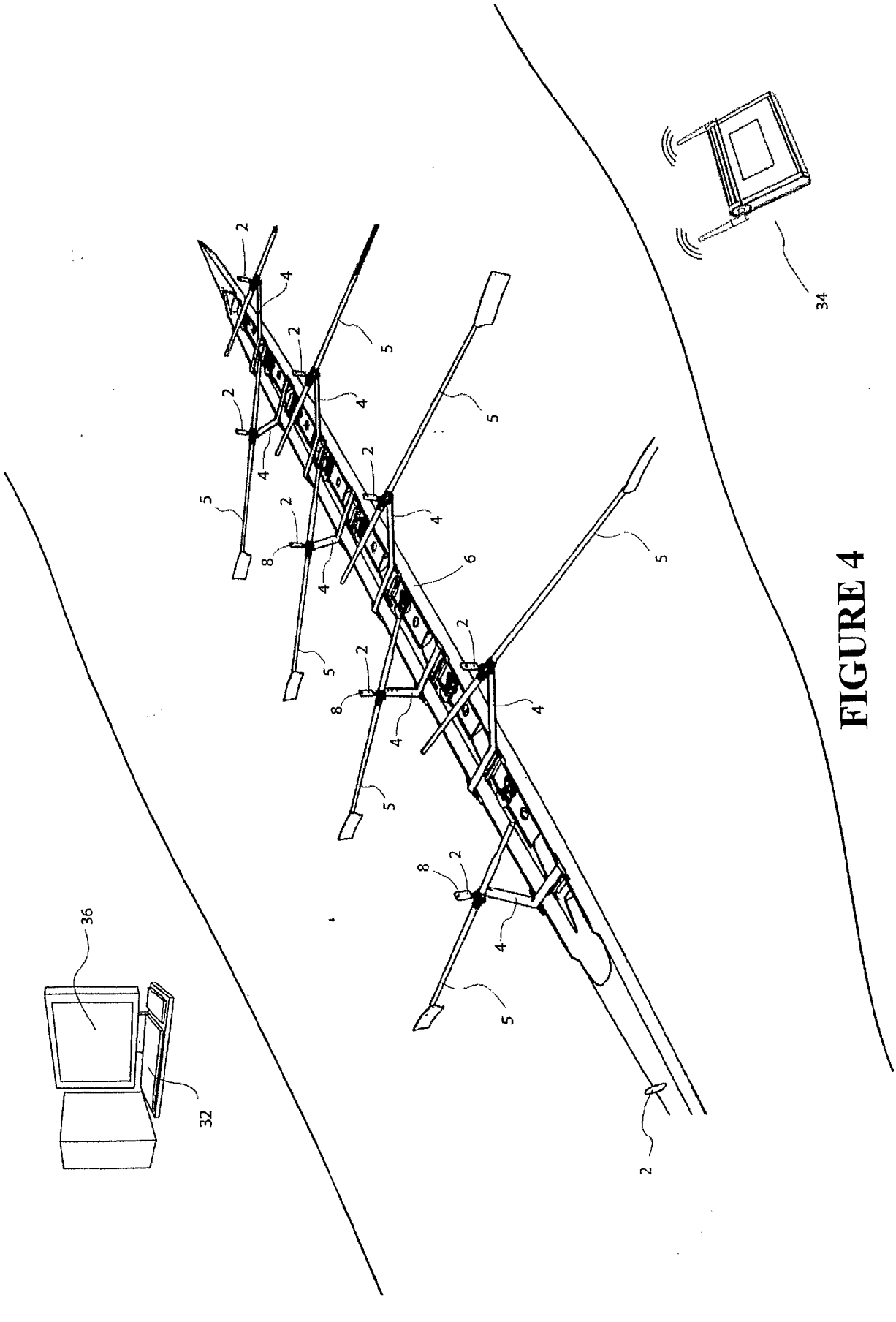


FIGURE 4

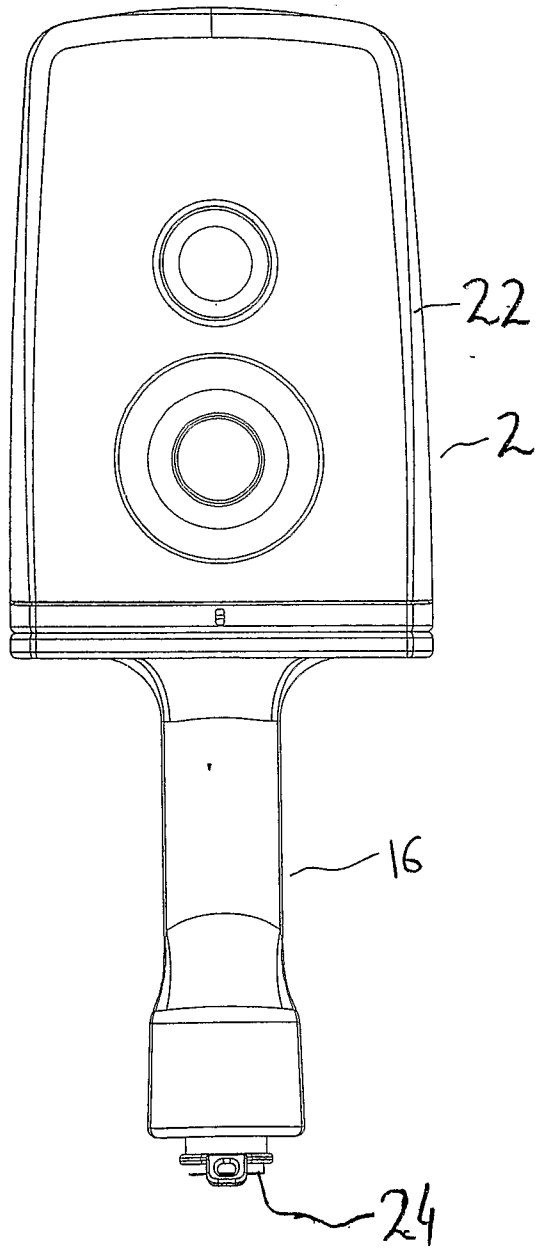


FIGURE 5

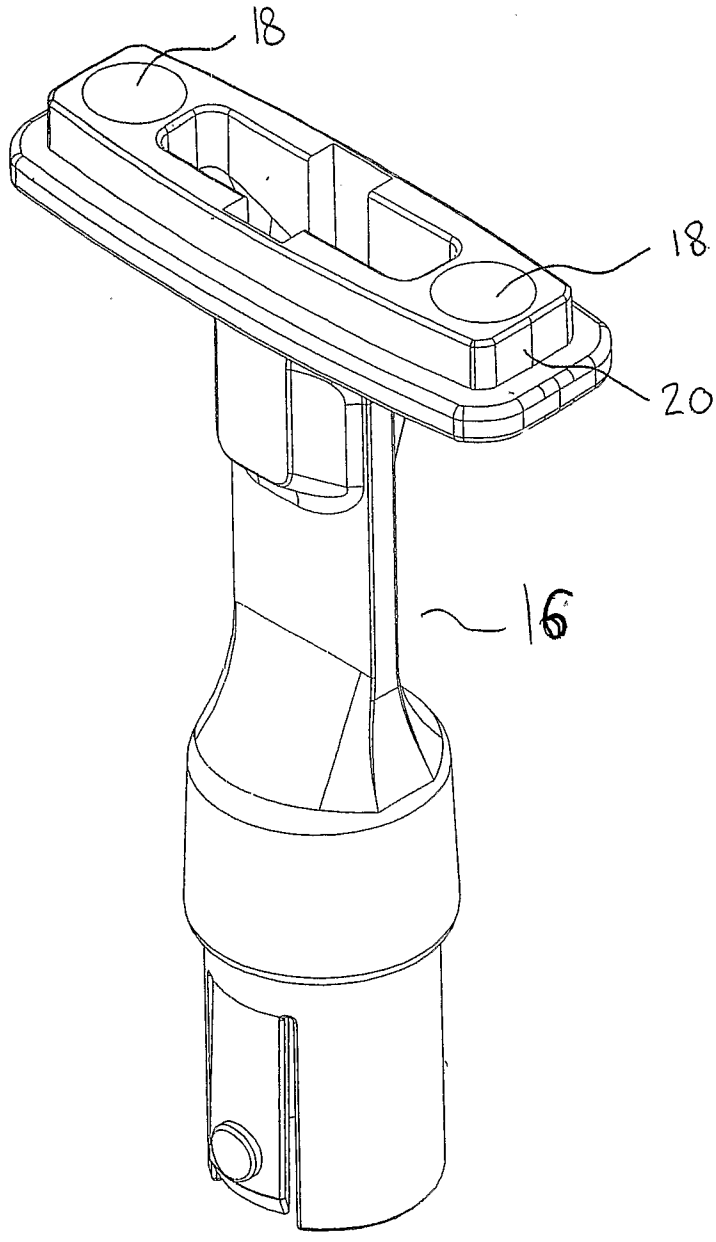


FIGURE 6

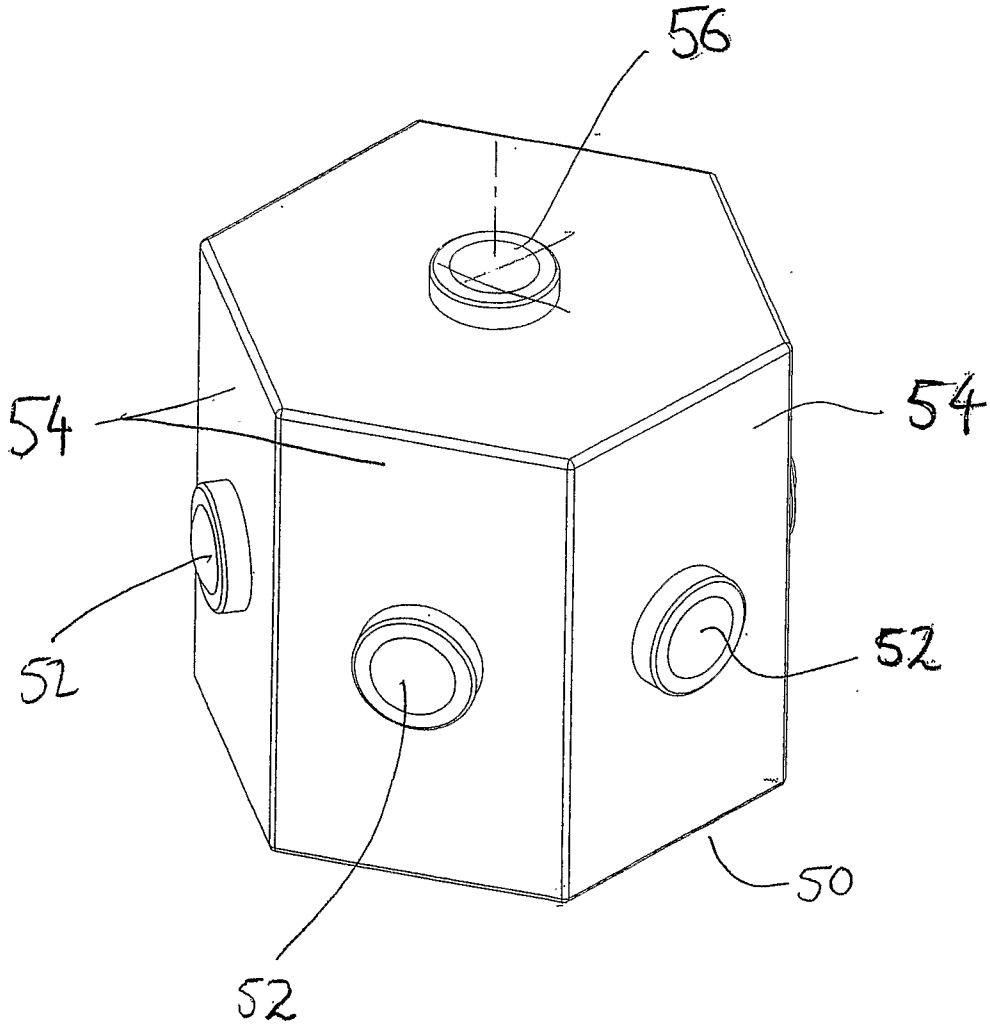


FIGURE 7

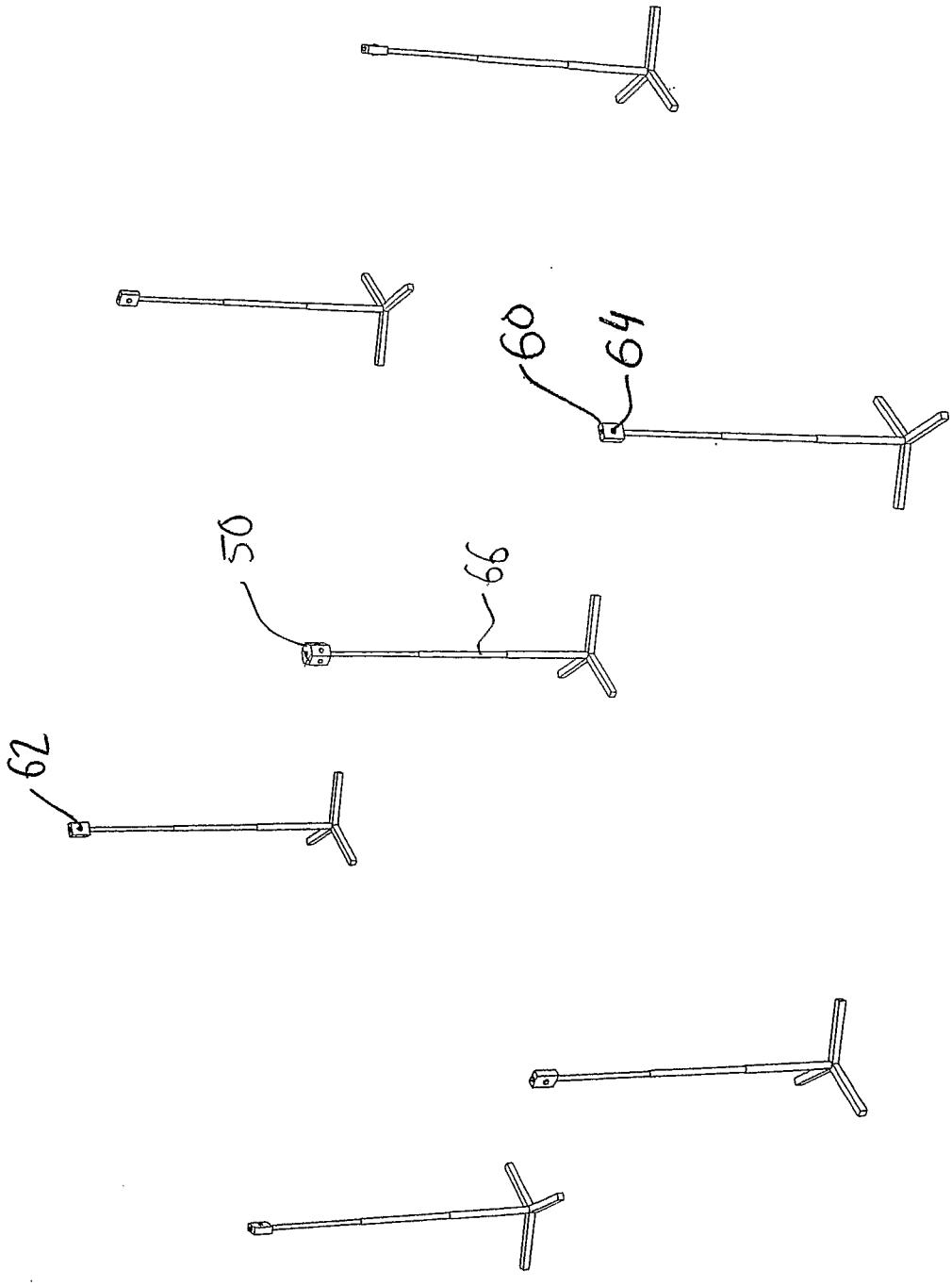


FIGURE 8

FIGURE 9

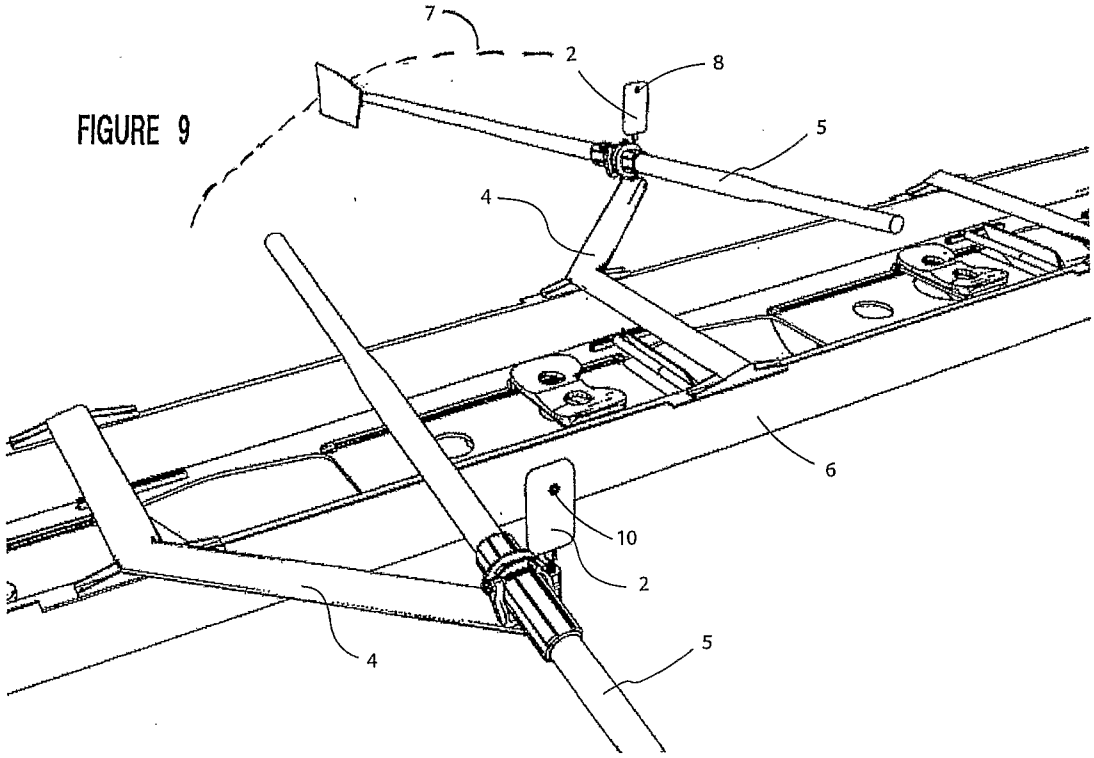
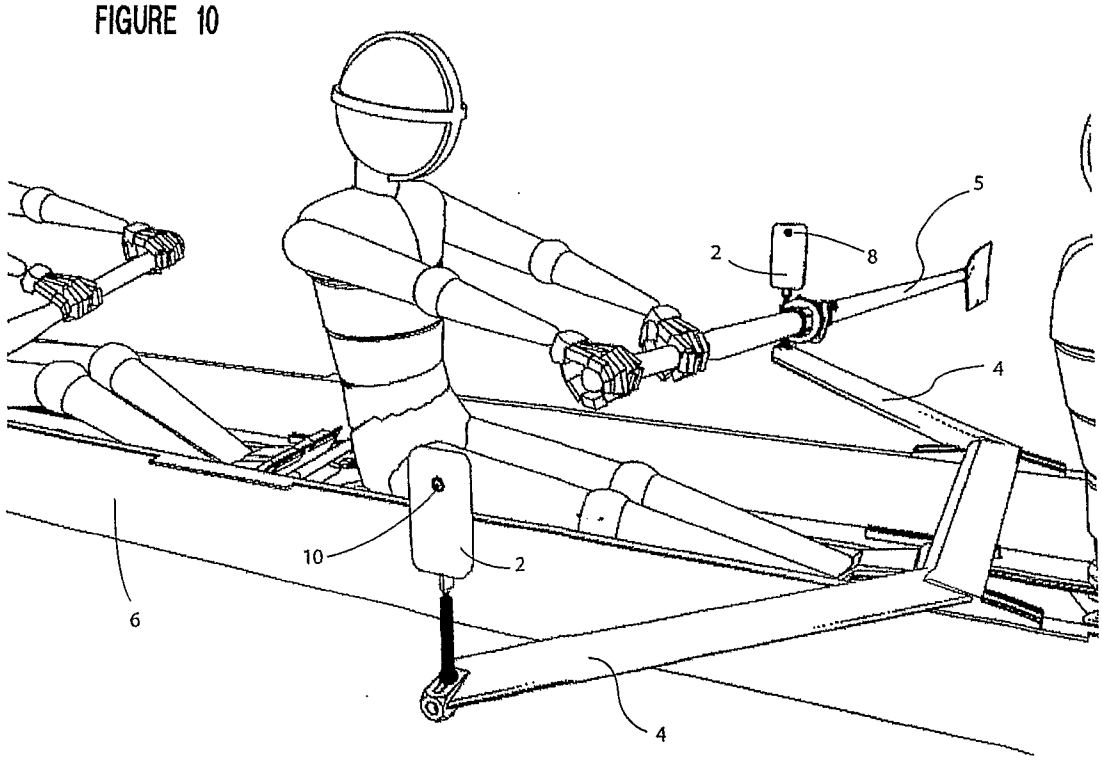


FIGURE 10



10/12

figure 11c

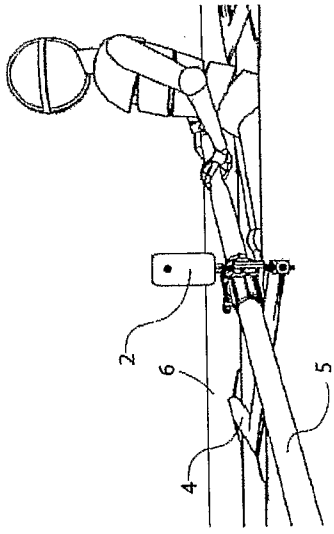


figure 11f

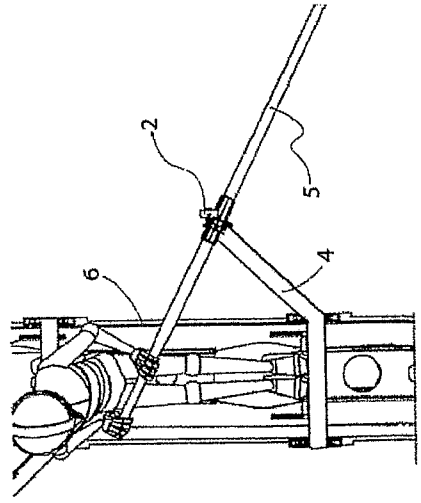


figure 11b

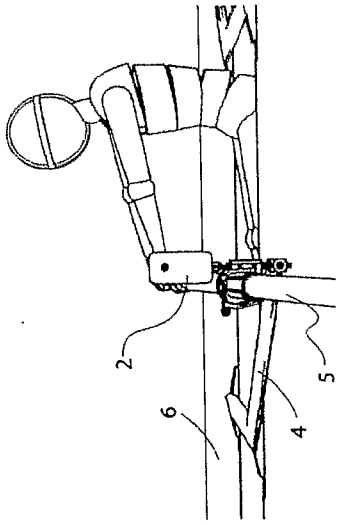


figure 11e

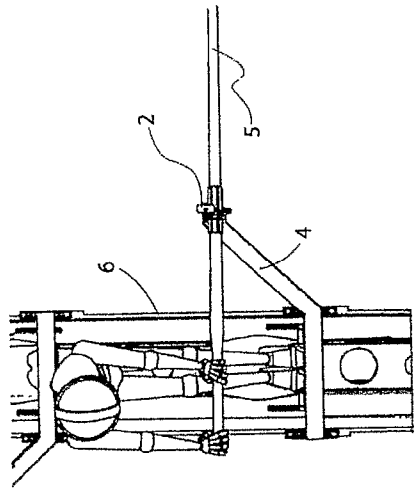


figure 11a

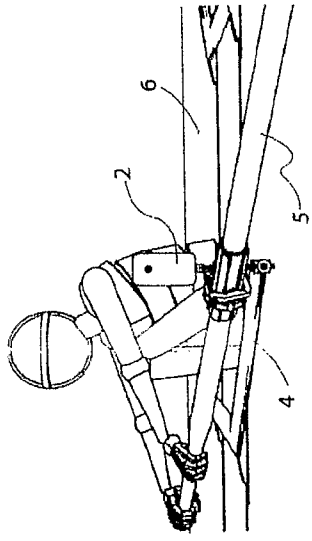
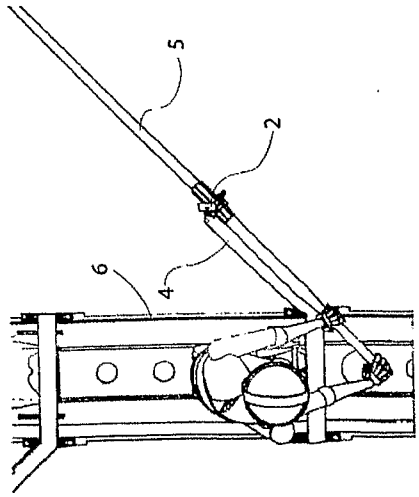


figure 11d



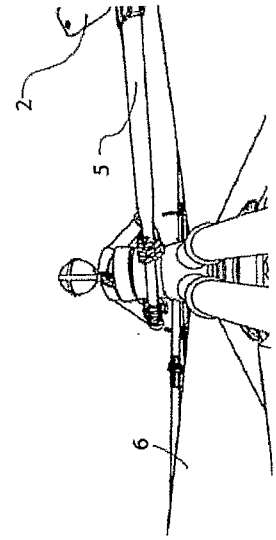


figure 12c

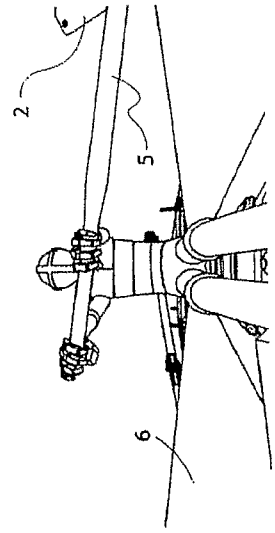


figure 12b

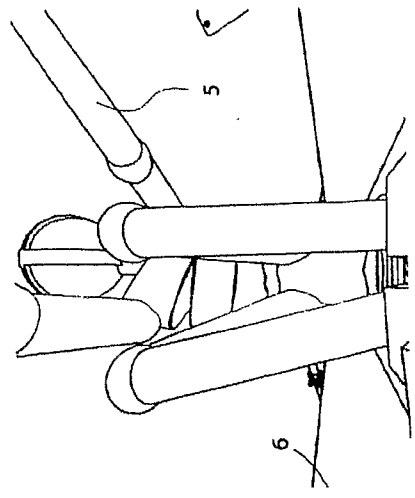


figure 12a

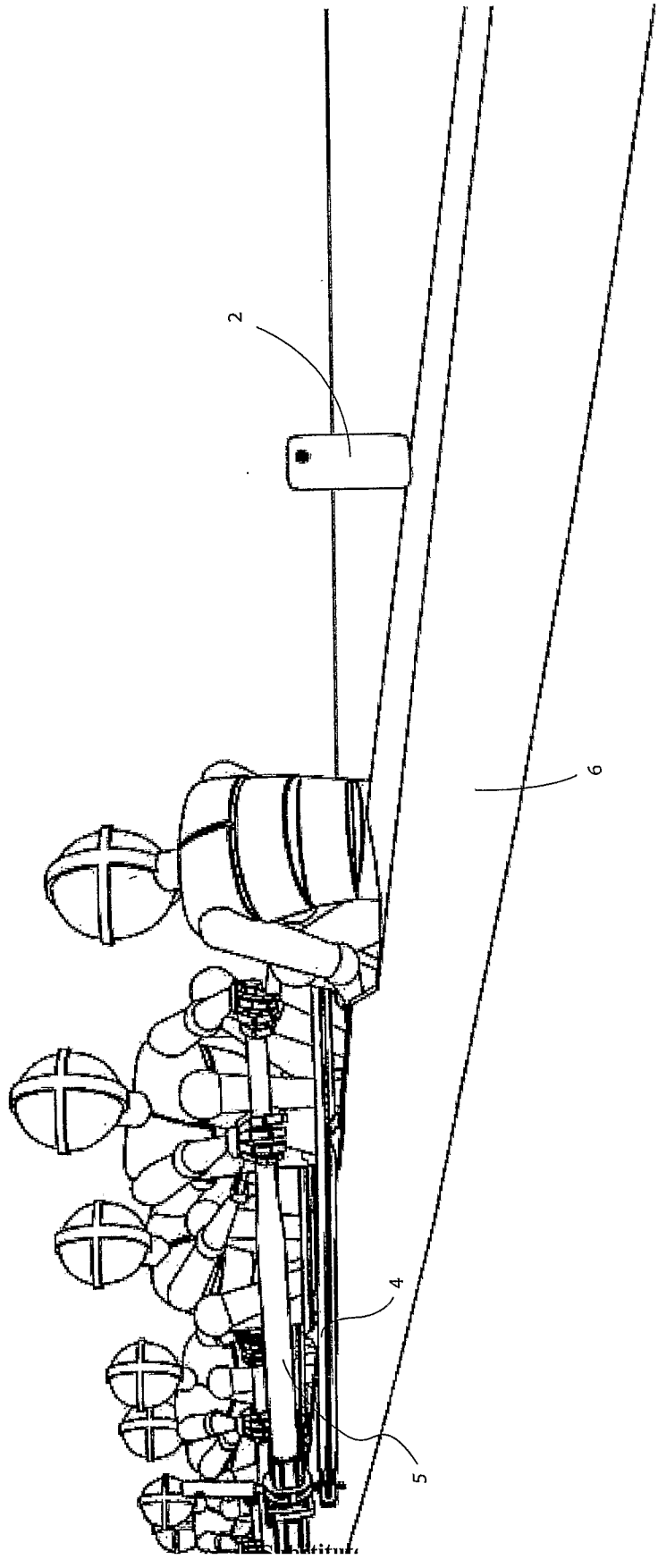


FIGURE 13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2009/001310

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

G02B 27/00 (2006.01) ***A63B 69/06*** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DWPI, EPODOC Keywords: camera, imag, video, view, pictur; lens, lenses; oppos, revers, backward, behind, direction, facing, differ; captur, imag, record, relay, view; simultaneous, synchronis, join, concurrent, same time, pair_up, overlay, overlap; parallel, same, coincident, axis, axes; two, second, pair, third, fourth, more, plural, multipl & similar terms; row, oar, paddle, propel; train, coach
TXTE: IPC A63B, G09B, B63B-B63J with Keywords: camera, imag; oar, row lock

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
L, P, X	*Sibi* product information, retrieved from the internet on 22 October 2009 from http://www.yepp.com.au/title_pages/YePP_products.aspx (see also http://www.yepp.com.au/title_pages/YePP_news_detail/200810w1b/200810w1b.aspx for *Sibi* launch date, of 3 October 2008)	1, 2, 4-7, 9-11,13
X	US 2005/0085348 A1 (KIEFER et al.) 21 April 2005 Pages 2, 3, 8, 9, Figure 26, claims 43-47	1-12, 15-33
A	US 4500203 A (BIERINGER) 19 February 1985 Abstract	1-10

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 January 2010	13 JAN 2010
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. +61 2 6283 7999	Authorized officer **MICHAEL HALL** AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : +61 2 6283 2474

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2009/001310

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Patent Abstracts of Japan, JP 10-023363 A (SONY CORP) 23 January 1998 Abstract	1-10
A	US 7217164 B2 (SHORT) 15 May 2007 Columns 4-5, Figures 1a, 1b	11-33
A	WO 2005/072464 A2 (FORESIGHT VISION, LLC) 11 August 2005 Pages 6-10, Figures 1 and 5	11-33

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2009/001310

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
See separate sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

Supplemental Box
(To be used when the space in any of Boxes I to IV is not sufficient)

Continuation of Box No. III:

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

In assessing whether there is more than one invention claimed, I have given consideration to those features which can be considered to potentially distinguish the claimed combination of features from the prior art. Where different claims have different distinguishing features they define different inventions.

This International Searching Authority has found that there are different inventions as follows:

(1) Claims 1-10 are directed to an imaging system. It is considered that an imaging device having two lenses facing in opposing directions and adapted to simultaneously capture and record images from the two lenses comprises a first distinguishing feature.

(2) Claims 11-33 are directed to a system for capturing images of a rower's stroke while rowing in a rowing apparatus. It is considered that a fixed mounting arrangement for an imaging device with respect to the rowing apparatus comprises a second distinguishing feature.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

Each of the abovementioned groups of claims has a different distinguishing feature and they do not share any feature which could satisfy the requirement for being a special technical feature. Because there is no common special technical feature it follows that there is no technical relationship between the identified inventions. Therefore the claims do not satisfy the requirement of unity of invention *a priori*.

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/AU2009/001310**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	2005085348	WO	2005037379				
US	4500203	NONE					
JP	10023363	NONE					
US	7217164	AU	2006202339	US	2007032143		
WO	2005072464	AU	2005208992	EP	1716042	US	7207853
		US	2005170711				

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX