



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.07.2007 Bulletin 2007/30

(51) Int Cl.:
A63B 55/00 (2006.01) A63B 69/36 (2006.01)
A63B 24/00 (2006.01)

(21) Application number: **06005267.7**

(22) Date of filing: **15.03.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

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(30) Priority: **19.01.2006 US 760148 P**

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(54) **Golf diagnosis apparatus, golf equipment device, golf diagnosis system, and method of mounting a golf diagnosis apparatus**

(57) A golf diagnosis apparatus for evaluating a stroke of a golf player captured by an image acquisition device, the golf diagnosis apparatus being adapted in such a manner that at least a part of the golf diagnosis apparatus is mountable on a golf equipment device.

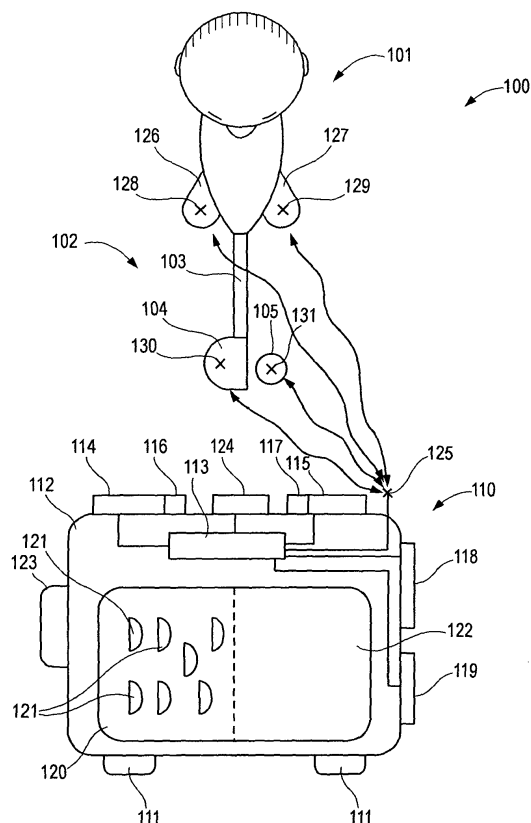


Fig. 1

Description

[0001] The invention relates to a golf diagnosis apparatus.

Moreover, the invention relates to a golf equipment device.

Furthermore, the invention relates to a golf diagnosis system.

[0002] The invention further relates to a method of mounting a golf diagnosis apparatus.

[0003] US 2005/0026710 A1 discloses a video image acquisition apparatus having one or multiple digital cameras taking images of a flying golf ball created by at least two flashes or strobes of light on continuous video mode at a predetermined frame rate. Each image frame is then subtracted from the background and compared to determine the existence of the ball image in flight. Furthermore, another video image acquisition apparatus is also disclosed in US 2005/0026710 A that consists of at least two video cameras taking images of flying golf balls created by at least two flashes or strobes of light at predetermined time intervals. The apparatus then applies triangulate calculation of the two camera images to determine the exact physical locations of the flying golf balls in space at a given time of flight.

[0004] However, conventional golf diagnosis systems suffer from the fact that they are inconvenient in use.

[0005] It is an object of the invention to provide a user-friendly golf diagnosis system.

In order to achieve the object defined above, a golf diagnosis apparatus, a golf equipment device, a golf diagnosis system and a method of mounting a golf diagnosis apparatus according to the independent claims are provided.

[0006] According to an exemplary embodiment of the invention, a golf diagnosis apparatus for evaluating a performance, particularly a stroke of a golf player captured by an image acquisition device is provided, the golf diagnosis apparatus being adapted in such a manner that at least a part of the golf diagnosis apparatus is mountable (or installable) or mounted (or installed) on a golf equipment device.

[0007] According to another exemplary embodiment of the invention, a golf equipment device is provided, the golf equipment device being adapted for mounting at least a part of a golf diagnosis apparatus for evaluating a performance, particularly a stroke of a golf player captured by an image acquisition device.

[0008] According to still another exemplary embodiment of the invention, a golf diagnosis system is provided, comprising a golf diagnosis apparatus having the above-mentioned features and a golf equipment device having the above-mentioned features, wherein at least a part of the golf diagnosis apparatus is mountable (or installable) or mounted (or installed) on the golf equipment device.

[0009] According to yet another exemplary embodiment of the invention, a method of mounting a golf diagnosis apparatus for evaluating a performance, particu-

larly a stroke of a golf player captured by an image acquisition device is provided, the method comprising mounting at least a part of the golf diagnosis apparatus on a golf equipment device.

[0010] The term "performance" of a golf player may particularly denote any action a golf player takes before, during or after carrying out a stroke. This may particularly include the behavior before the stroke, for instance when the golf player walks to the tee. It may particularly include the behavior directly before the stroke, for instance when the golf player stands in front of the tee and concentrates before carrying out the stroke. It may particularly include the behavior during the stroke, for instance when the golf player swings the golf club and hits the golf ball. It may particularly include the behavior after the stroke, for instance when the golf ball has left the tee/golf club and flies in the direction of the goal.

[0011] In the context of this application, the term "stroke" may particularly denote the entire procedure or a part of the procedure including a swing with the golf club, a hit between golf club and golf ball, and the flight of the golf ball until the ball rests. A stroke may be at least a part of the performance.

[0012] In the context of this application, the term "stroke distance" may particularly denote the distance between a resting position of the golf ball before a stroke and after the stroke.

[0013] In the context of this application, the term "hit" may particularly denote the short time interval in which an interaction between the golf club and the golf ball occurs.

[0014] According to an exemplary embodiment of the invention, a golf diagnosis apparatus is at least partially embedded in a golf equipment device which a golf player usually carries or moves with herself or himself anyway when playing golf. Thus, it may be dispensable to provide the golf diagnosis apparatus as a completely separate device which conventionally has to be carried separately from the usual golf equipment devices when playing golf. Taking this measure may reduce the number of items to be carried when playing golf, and may reduce the size and weight of the entire equipment. For instance, such a golf diagnosis apparatus may be implemented or integrally formed with a golf caddy, a golf bag or a golf cart. Thus, the different components of such items of golf equipment may be used in a synergetic manner with the golf diagnosis apparatus.

[0015] The term "golf diagnosis apparatus" may particularly denote an apparatus which may monitor the performance of a golf player and may carry out calculations in correspondence with this performance. Also golf simulators may be covered by the term "golf diagnosis apparatus". For instance, such a golf diagnosis apparatus may comprise one or more cameras making one or more pictures (in a single picture mode or in a continuous video mode) of a golf ball and/or a golf club and/or a golf player in order to derive therefrom information allowing to perform a diagnosis of a golf stroke.

[0016] For instance, a stroboscope may define different points of time at which an image is taken, and the individual images may be evaluated using image recognition methods so as to analyze a stroke of a golf player. For instance, such a golf diagnosis apparatus may calculate parameters like velocity, angle, acceleration, spin, stroke distance, etc. in accordance with a stroke. Such a system may be implemented also in combination with a self-adaptive golf analysis feature, allowing to determine which body positions, or other stroke parameters statistically yield good results, and which not. Thus, such a golf diagnosis system may provide a golfer with suggestions as to how to improve the performance or provide information which parameters have been successful in the past.

[0017] In the context of such a golf diagnosis apparatus, a golfer may position a golf ball on the tee, may select a golf club and may carry out a stroke. In the vicinity of the tee, the user may position the golf diagnosis apparatus which may comprise a camera or another image acquisition device so that one or more images can be captured before, during and/or after hitting the ball. Such images may then be evaluated, with respect to ball, golf club, and/or body position of the golfer so as to derive parameters allowing to perform a diagnosis of a stroke so as to evaluate the quality of the stroke.

[0018] According to an exemplary embodiment of the invention, such a golf diagnosis apparatus is not provided as a separate individual device, but may be at least partially (or completely) integrated within a golf equipment device like a caddy and/or a golf bag and/or a golf cart.

[0019] Thus, a golf diagnosis device may be mounted on the golf equipment itself. This may include mounting a voltage supply on or in the golf equipment. An accumulator, an array of solar cells, a battery, etc. are appropriate for being embedded in or attached to golf equipment like a golf bag or a golf cart. Alternatively, it is possible when using golf equipment which requires an electric energy supply, to use synergistically a single shared voltage source for both the golf equipment and the golf diagnosis device. For instance, a battery used for an electromotor of a golf cart may also be used for driving the golf diagnosis device.

[0020] The golf bag and/or the golf caddy may be used to house a display and/or a user input/output device of a golf diagnosis device, particularly at a position of the golf equipment which is anatomically advantageous for the golfer so as to allow a user-friendly operation of the golf diagnosis device.

[0021] The golf bag and/or the golf caddy may be used in order to store or receive a voltage supply (for instance an accumulator) for a golf diagnosis device.

[0022] The voltage supply of an electrically driven golf caddy may also be used for operating the golf diagnosis device.

[0023] The golf diagnosis apparatus with the combined golf equipment device may be provided as a portable (or movable) device so as to allow to transport the combined

system along a golf course.

[0024] It is also possible to provide an additional camera and/or an additional flash (e.g. a strobe) at the launch monitor. The integrated system according to an exemplary embodiment of the invention may thus comprise interfaces/adapters for (detachably) connecting additional elements like further cameras or flashes. Such additional items may make it possible, for instance, to take images of the golfer from different positions so as to increase the amount of information from which the golf diagnosis results may be derived.

[0025] The launch monitor may measure the motion of the golf ball hit by a golf player and/or the motion of a golf club before and/or after the point of time at which the golf club hits the golf ball.

[0026] Such a launch monitor may be connected to one or more additional cameras and flashes so that the golf player may be provided with additional image information with respect to a stroke. The position of the camera and the monitoring angle may be selected by the golfer herself or himself. For the additional cameras and flash devices, the point of time, related to the stroke moment or related to a light barrier measurement before the hit moment may be defined. The body position of the golfer can thus be determined from different angular positions at defined points of time for one golf stroke.

[0027] There are different exemplary possibilities for the acquisition:

- a trigger signal may actuate an image acquisition with a short exposure time.
- an acquisition may be actuated with a longer exposure time and optionally with a flash. A trigger signal then actuates one or a plurality of subsequent short flashes within this exposure time.

[0028] Thus, according to an exemplary embodiment, timely precisely controlled additional acquisitions may be carried out with at least one further camera and/or flash.

[0029] It is also possible to provide one or a plurality of additional sensors at the launch monitor.

[0030] The launch monitor may measure the motion of the hit golf ball and/or may measure the golf club before and/or after the point of time of the stroke. The launch monitor may be provided with one or more additional sensors for detecting of parameters of the motion of the golf player and/or of the equipment.

[0031] There are different embodiments for such sensors. Particularly, pressure sensors may be implemented for measuring the distribution of the weight on the legs of the golfer. It is also possible to use pressure sensors to measure the weight distribution at different portions of the foot, for instance at the front part and the back part of the foot. Such pressure sensors may be integrated in soles for being inserted in golf shoes. The information of the sensors can be transmitted in a wired manner or in a wireless manner to the golf launch monitor. Thus, according to an exemplary embodiment, the weight distri-

bution of the golfer may be correlated to the motion sequence and to the stroke.

[0032] According to a further exemplary embodiment of the invention, wireless communicating additional devices, accessory units, or auxiliary equipment may be used. Thus, it is optionally possible to connect additional sensors via wireless communication to a golf launch monitor.

[0033] The launch monitor may measure the motion of the hit golf ball and/or the motion of the golf club before and/or after the point of time of the hit. The launch monitor may be provided with optional additional devices like sensors, cameras or flashes for detecting of parameters of the motion of the golfer, the ball and/or the equipment. The communication with the additional devices can be carried out using cables or a wireless communication path. Particularly, it is possible to use Bluetooth for such a communication. It is also possible to use infrared communication, radio frequency communication, a (mobile) telecommunication network, wireless LAN (WLAN), etc.

[0034] Next, further exemplary embodiments of the invention will be explained.

In the following, further exemplary embodiments of the golf diagnosis apparatus will be explained. However, these embodiments also apply for the golf equipment device, for the golf diagnosis system and for the method of mounting a golf diagnosis apparatus for evaluating a stroke of a golf player captured by an image acquisition device.

[0035] The golf diagnosis apparatus may comprise at least one of the group consisting of the image acquisition device, a power supply unit for supplying at least a part of the golf diagnosis apparatus with electrical energy, an optical display unit for displaying golf diagnosis related information, a user interface unit for allowing a user to communicate with at least a part of the golf diagnosis apparatus, a sensor unit for sensing at least one golf diagnosis related sensor parameter, a stroboscope unit for generating pulses of electromagnetic radiation (for instance infrared or visible or ultraviolet light flashes), and a data evaluation unit for evaluating golf diagnosis related data.

[0036] The image acquisition device may be a camera, for instance a CCD camera. It is also possible to provide a plurality of cameras.

[0037] The power supply unit may be a battery, an accumulator, solar cells, etc.

The optical display unit may be a monitor, like an LCD monitor, a TFT monitor, an OLED (organic LED) based display, a plasma monitor or a conventional cathode ray tube.

[0038] The user interface unit may comprise input elements like a keypad, a joystick, a trackball, or may even comprise a voice recognition system. The user interface unit may also include a touch screen.

[0039] A sensor unit may be any kind of sensor, like a sensor of acoustic waves (for instance for detecting a point of time at which the golf club hits the golf ball), an

optical sensor, a position sensor, a pressure sensor for detecting the weight distribution within the shoes of the golfer, a pressure sensitive platform or mat (pad), etc.

[0040] One or more flashlight units, for instance strobes, may be provided so as to define different points of time at which the golf ball shall be visible at an image of the camera. Therefore, by taking a plurality of images of the golf ball and/or the golf club and/or the golf player, it is possible to derive motion parameters from the captured images.

[0041] The data evaluation unit may a CPU (central processing unit) and may include also a storage device, an input/output unit, etc. Such a data evaluation unit may carry out calculations in accordance with pre-stored algorithms so as to derive golf analysis related parameters from the captured information.

[0042] The part of the golf diagnosis apparatus mountable on the golf equipment device and the part of the golf diagnosis apparatus mountable separately from the golf equipment device may be communicatively coupled to one another. Thus, although the two parts may be spatially separated, a communication and thus functional co-operation of such components may be made possible. Such a communication may be wired or wireless. Particularly, a Bluetooth communication is possible. Bluetooth is an industrial specification for wireless personal area networks (PANs). Bluetooth provides a way to connect and exchange information between components of the golf diagnosis systems via a secure, low cost, short-range radio frequency. Bluetooth is a very well developed and cheap way of communicating between the devices of the golf diagnosis systems and may particularly allow communication between a central processing unit, digital cameras, sensors, flashlight units, an input/output device, etc.

[0043] For instance, it is possible that the golf player uses a watch-like element carried on her or his wrist to program or control the golf diagnosis system. Thus, it is not necessary that the golfer, for programming the system, has to move personally to the golf diagnosis apparatus which may be integrated in her or his golf caddy. Furthermore, by such a wireless communication, a distributed system of components of the golf diagnosis system may be provided, and may be operated in a user-friendly manner.

[0044] For instance, it is also possible that pressure sensors in the soles of the golf shoe may communicate wirelessly with the CPU. It is also possible that markers are provided at the golf club and/or at the golf ball and/or at other golf equipment units and provide information to the central processing unit which may allow to evaluate the stroke characteristics of the golf club.

[0045] The part of the golf diagnosis apparatus mountable on the golf equipment device may comprise an adapter adapted for connecting at least one additional component. Such additional components may be, for instance, additional image acquisition devices, an additional sensor unit, an additional flashlight unit, and an addi-

tional stroboscope unit. Thus, a modular system is provided which can be extended, or even retrofitted, so that the performance and the functionality of the system may be extended step by step. Thus, a very flexible system may be provided.

[0046] Such an adapter or user port may particularly be an electric adapter like a connection plug board. Such an adapter may include support structures, clips, stand arms, etc., at which auxiliary equipment may be fastened. For example, it may be possible to use a connection to a battery of a golf cart or a golf caddy, connect it to an intermediate piece like a T-piece and use this specially designed/shaped T-piece as a connector for one or a plurality of additional equipment items.

[0047] The golf diagnosis apparatus may comprise a plurality of image acquisition devices positioned to capture images of a golf player carrying out a stroke from different viewing directions. Thus, the amount of information provided and usable for assessing a stroke and the quality thereof may be increased and refined. Particularly, complementary information from different viewing directions may be obtained.

[0048] The golf diagnosis apparatus may comprise a sensor unit adapted to sense at least one sensor parameter related to a golf player carrying out a stroke. Such a sensor parameter may be a pressure with which the weight of the golf player acts during carrying out the stroke, motion related parameters during the stroke (for instance a position, velocity, acceleration, etc., of a golf ball, a golf club, the golf player, etc.).

[0049] The sensor unit may be adapted to sense at least one of the group consisting of a weight distribution acting on the feet of a golf player carrying out the stroke, a weight distribution acting on different portions of a foot of the golf player carrying out the stroke, etc. More generally, the weight distribution during carrying out a stroke may be evaluated.

[0050] Particularly, the sensor unit may be provided in a sole for insertion in a golf shoe. Such a sensor unit may be a pressure sensor, for instance on the basis of a semiconductor device, and may communicate with a central control unit for instance by Bluetooth, or using an RFID tag. Therefore, the distributed sensors in the sole may be enabled to communicate in an easy and reliable manner with a central read/write station in accordance with RFID tag technology.

[0051] In the following, further exemplary embodiments of the golf equipment device will be explained. However, these embodiments also apply for the golf diagnosis apparatus, for the golf diagnosis system and for the method of mounting a golf diagnosis apparatus.

[0052] The golf equipment device may be a golf bag, a golf caddy, a golf cart, a golf glove, a golf shoe, a golf suit and/or a golf cap. For example, relatively heavy components like the camera, a display device, a user input/output device, a battery, etc. may be provided in components like a golf bag, a golf caddy or a golf cart which may include wheels for sliding the system along a golf

course. Thus, the weight which has to be carried by a golf player using a golf diagnosis apparatus may be significantly reduced.

[0053] Furthermore, also other golf equipment like a golf glove, a golf shoe, a golf suit and a golf cap may be used, particularly for providing locally distributed sensors which may provide additional information being meaningful in the context of the golf diagnosis evaluation.

[0054] The golf equipment device may be adapted for mounting the golf diagnosis apparatus at such a height that the golf diagnosis apparatus is located, in normal use, at an anatomically appropriate position for a golfer. For instance, a display device and/or an input/output unit may be provided at a golf cart at such a height that a golfer with a normal height (of 5 to 7 feet, for instance) may conveniently use the device without stooping or tip-toeing.

[0055] The golf equipment device may be adapted for mounting, as the part of the golf diagnosis apparatus, at least one of the group consisting of the image acquisition system, a power supply unit, an optical display unit, a user interface unit, a sensor unit, and a data evaluation unit. Thus, the golf equipment device may have the corresponding provisions, like fastening elements, receiving spaces, etc. which may be specifically designed to receive or support such individual components.

[0056] In the following, further exemplary embodiments of the golf diagnosis system will be explained. However, these embodiments also apply for the golf diagnosis apparatus, for the golf equipment device and for the method of mounting a golf diagnosis apparatus.

[0057] The golf diagnosis system may comprise a component (for instance a power supply unit) which is functionally shared by the golf diagnosis apparatus and the golf equipment device. For instance, when the golf diagnosis apparatus is implemented in a golf cart, it is possible that a battery for powering the golf cart is also used for powering the golf diagnosis apparatus. By providing a common power supply unit, or other commonly shared components, the golf diagnosis system including the golf diagnosis apparatus and/or the golf equipment device may be provided with a reduced size, with reduced weight and with reduced costs.

[0058] The aspects defined above and further aspects of the invention are apparent from the examples of embodiment to be described hereinafter and are explained with reference to these examples of embodiment.

[0059] The invention will be described in more detail hereinafter with reference to examples of embodiment but to which the invention is not limited.

[0060] Figure 1 illustrates a golf diagnosis system according to an exemplary embodiment of the invention.

[0061] Figure 2 illustrates a golf caddy and a golf bag with an integrated golf diagnosis apparatus according to an exemplary embodiment of the invention.

[0062] Figure 3 is a golf caddy with a golf diagnosis apparatus mounted thereon according to an exemplary embodiment of the invention.

[0063] Figure 4 is a golf cart with an integrated golf diagnosis apparatus according to an exemplary embodiment of the invention.

[0064] Figure 5 is a sole for a golf shoe as a part of a golf diagnosis system according to an exemplary embodiment of the invention.

[0065] The illustration in the drawing is schematically. In different drawings, similar or identical elements are provided with the same reference signs.

[0066] In the following, referring to **Fig. 1**, a golf diagnosis system 100 according to an exemplary embodiment of the invention will be described.

[0067] As shown in Fig. 1, a golf player 101 is in a position to carry a golf club 102 including a shaft 103 and a club head 104. A golf ball 105 is positioned on a tee (not shown).

[0068] Furthermore, Fig. 1 shows a golf caddy 110 comprising a static support including wheels 111 on which a golf bag 112 is mounted. A plurality of components of a golf diagnosis apparatus are embedded in the golf bag 112.

[0069] A handle 123 is shown which allows a golfer 101 to move the golf caddy/golf bag 110 along a golf course.

[0070] The golf diagnosis apparatus comprises a central processing unit (CPU) 113 which includes processing resources and storage resources. The CPU 113 is the control system over the entire golf diagnosis apparatus. The CPU 113 is electrically coupled (in a bidirectional manner or in a unidirectional manner) with a first CCD (charge coupled device) camera 114 and with a second CCD camera 115. Instead of providing two CCD cameras 114, 115, it is also possible that only a single camera is provided, or a number of cameras which is larger than two. It may be particularly advantageous to provide only a single camera, since this may allow to manufacture the device with low costs and in small size. The provision of two cameras in Fig. 1 is thus not to be understood as a limiting feature for the invention. Particularly, the second camera 115 is merely optional, and a performance with only the first camera 114 is sufficient. The CCD cameras 114, 115 are adapted to monitor the golf player 101 from different viewing directions/viewing angles so as to derive complementary information for evaluating a stroke of the golfer 101.

[0071] Furthermore, a first flash 116 and a second flash 117 are provided. The flashes 116, 117 can be positioned at any desired position of the golf diagnosis apparatus, particularly attached to a casing of the golf diagnosis apparatus. The flashes 116, 117 may emit light flashes so as to define points of time at which images of the golf club 102, of the golf ball 105 and of the golf player 101 are captured by the cameras 114, 115. As an alternative for the flashes 116, 117, strobes may be provided. It is possible to implement such light flash sources using LEDs, particularly OLEDs. Instead of using two flashes, it is possible to use only one flash or at least three flashes. For example, each of the two flashes 116, 117 can emit

a single flash, or a single flash may emit two flashes. Also the number of light pulses may vary, and can be larger or smaller than two.

[0072] Furthermore, the CPU 113 is coupled to an LCD display 118 as an optical display unit for displaying results of the golf diagnosis.

[0073] Moreover, the CPU 113 is coupled to an input/output device 119 like a keypad, a joystick, a touch screen or the like so as to provide the CPU 113 with control information. For instance, the golfer 101 may input, via the input/output device 119, information indicating a club 102 which shall be used for the strike, so as to provide the system 110 with the required information needed to evaluate the stroke.

[0074] Each of the components 114 to 119 may be plugged into correspondingly designed adapters of the golf diagnosis apparatus 100 so that individual components may be retrofitted, substituted, or replaced. Thus, a modular system may be provided.

[0075] Apart from the described components of the golf diagnosis apparatus, the golf bag 112 comprises a first receiving section 120 adapted for receiving various golf clubs 121 and comprises a second reception space 122 adapted for receiving other items, like drinks, clothing, etc.

[0076] As can be taken from Fig. 1, the functionality of a conventional golf bag 112/golf caddy 110 can be combined with the functionality of a golf diagnosis apparatus. Thus, by providing all these elements "in one apparatus", a small dimensioned apparatus may be provided which is relatively light weight, easy to handle, and thus convenient in use.

[0077] Although not shown in Fig. 1, a battery is housed in the golf bag 112/golf caddy 110 so as to supply the various components of the golf diagnosis apparatus 100 with electrical energy.

[0078] As further shown in Fig. 1, a microphone 124 is provided for detecting acoustic waves resulting from a hit between the golf club head 104 and the ball 105.

[0079] Furthermore, a Bluetooth communication interface 125 is foreseen at the combined golf diagnosis apparatus/golf bag/golf cart arrangement 100, and is coupled to the CPU 113. Via the Bluetooth communication interface 125, wireless communication with sensors 128, 129 located in both shoes 126, 127 of the golfer 101 is possible. Furthermore, wireless communication with a sensor 130 provided in the golf club head 104 and with a sensor 131 provided in the golf ball 105 is possible.

[0080] In the following, the functionality of the system 100 will be explained in more detail.

[0081] When the golf player 101 has operated the golf club 102 so that the club head 104 hits the ball 105, acoustic waves are generated. These are detected - with a corresponding delay - by the microphone 124. Consequently, the flashes 116, 117 are triggered to emit light pulses. Furthermore, points of times are defined by these flashes at which the cameras 114, 115 detect images of the hit ball 105, the moving club 102 and the moving golf

player 101 (essentially) during or after the hit.

[0082] Furthermore, sensor information from the sensors 128 to 131 are transmitted to the Bluetooth communication interface 125. All these items of information are used by the CPU 113 to derive golf diagnosis information, like angle information, velocity information, distance information, etc. A result of such an evaluation may be output via the display unit 118.

[0083] As an alternative to the microphone 124, a light barrier may be provided for detecting the time of hitting the ball 105.

[0084] Still referring to Fig. 1, the golf diagnosis apparatus 100 is adapted for evaluating a stroke of the golf player 101 captured by the cameras 114, 115. The golf diagnosis apparatus 100 is embedded partially in the golf cart 110/golf bag 112 as a golf equipment device. Particularly, the battery, the display 118, the input/output interface 119, the flashlight units 116, 117 and the data evaluation unit 113 are installed on and/or in the golf equipment 110.

[0085] However, another part of the golf diagnosis apparatus, namely the sensors 128 to 131 are located remotely with regard to the golf equipment device 110 and communicate wirelessly via the Bluetooth communication interface 125.

[0086] Slots or plug-in positions are provided at various positions of the golf diagnosis system so as to allow to flexibly extend the functionality of the golf diagnosis system to meet the preferences of a user.

[0087] The different camera positions 114, 115 allow to capture images of the golfer 101 from different positions. The pressure sensors 128, 129 allow to sense weight distributions of the golfer 101 body during the hit, which may be used for evaluating a quality of a stroke. Position sensors 130, 131 may allow to derive position information with regard to the club 102 and the ball 105 around the stroke.

[0088] Fig. 2 shows an image 200 of a golf caddy 201 and of a golf bag 202 mounted thereon.

An antenna is provided as a Bluetooth communication interface 125. A camera 114 is attached to the caddy 201. Furthermore, a combined user input/output device 118, 119 is mounted so as to enable a user to conveniently use the components 118, 119 even during carrying the golf diagnosis system 200. A battery 203 is provided as an energy supply for driving an electric motor for moving the golf caddy 201 and for providing the golf diagnosis system 200 with electrical energy.

[0089] Fig. 3 again shows a caddy 300 without a bag. In contrast to the systems of Fig. 1, Fig. 2, the system of Fig. 3 does not show explicitly a CPU. However, such a CPU may be integrated in or attached to the caddy 300. It is also possible that this CPU is arranged with a golf bag to be mounted on the caddy 300.

[0090] Fig. 4 shows a golf cart 400 with an electromotor (not shown) which may be used by a golfer for driving around a golf course.

[0091] A plurality of components of the golf diagnosis

systems are implemented or integrated within the golf cart 400. For instance, solar cells 401 contributing to the electric energy needed for driving the golf cart 400 and for driving the golf diagnosis system is provided. Furthermore, a (rechargeable) battery may be provided (not shown in Fig. 4). A display 118 is provided. Furthermore, buttons 401, 402 and a joystick 403 are foreseen as a user input device 119. Furthermore, a camera 114 is attached to the golf cart 400, wherein the camera 114 may be moved by an electromotor.

[0092] Fig. 5 shows a sole 500 for insertion into a golf shoe. Wireless Bluetooth, or wireless LAN tags are options for wireless communication schemes to operate sensors provided on and/or in such a sole 500.

[0093] The sole 500 comprises a first pressure sensor 501 and a second pressure sensor 502. The first pressure sensor 501 is provided at a front portion of the sole 500, whereas the second sensor 502 is provided at a back portion of the sole 500. The pressure sensors 501, 502 measure the time dependence of the weight distribution of different portions of the foot of a golfer during a stroke. Although not shown in Fig. 5, RFID tags are connected to the sensors 501, 502 so that sensor information from the sensors 501, 502 may be transmitted to a remote destination.

[0094] It should be noted that the term "comprising" does not exclude other elements or features and the "a" or "an" does not exclude a plurality. Also elements described in association with different embodiments may be combined.

[0095] It should also be noted that reference signs in the claims shall not be construed as limiting the scope of the claims.

Claims

1. A golf diagnosis apparatus for evaluating a performance, particularly a stroke, of a golf player captured by an image acquisition device, the golf diagnosis apparatus being adapted in such a manner that at least a part of the golf diagnosis apparatus is mountable on a golf equipment device.
2. The golf diagnosis apparatus according to claim 1, comprising at least one of the group consisting of the image acquisition device, a power supply unit for supplying at least a part of the golf diagnosis apparatus with electrical energy, an optical display unit for displaying golf diagnosis related information, a user interface unit for allowing a user to communicate with at least a part of the golf diagnosis apparatus, a sensor unit for sensing at least one golf diagnosis related sensor parameter, a stroboscope unit for generating pulses of electromagnetic radiation, and a data evaluation unit for evaluating golf diagnosis related data.

3. The golf diagnosis apparatus according to claim 1 or 2,
the golf diagnosis apparatus being adapted in such a manner that another part of the golf diagnosis apparatus is mountable separately from the golf equipment device. 5
4. The golf diagnosis apparatus according to claim 3, wherein the part of the golf diagnosis apparatus mountable on the golf equipment device and the part of the golf diagnosis apparatus mountable separately from the golf equipment device are communicatively coupled to one another. 10
5. The golf diagnosis apparatus according to claim 3 or 4, wherein the part of the golf diagnosis apparatus mountable on the golf equipment device and the part of the golf diagnosis apparatus mountable separately from the golf equipment device are coupled for a wireless communication. 20
6. The golf diagnosis apparatus according to any one of claims 3 to 5, wherein the part of the golf diagnosis apparatus mountable on the golf equipment device and the part of the golf diagnosis apparatus mountable separately from the golf equipment device are coupled by a Bluetooth communication. 25
7. The golf diagnosis apparatus according to any one of claims 1 to 6, wherein the part of the golf diagnosis apparatus mountable on the golf equipment device comprises an adapter for connecting at least one additional component. 30
8. The golf diagnosis apparatus according to claim 7, wherein the adapter is adapted for connecting, as the at least one additional component, at least one of the group consisting of an additional image acquisition device, an additional sensor unit, and an additional stroboscope unit. 35
9. The golf diagnosis apparatus according to any one of claims 1 to 8, comprising a plurality of image acquisition devices positioned to capture images of a golf player carrying out a stroke from different image capturing directions. 40
10. The golf diagnosis apparatus according to any one of claims 1 to 9, comprising a sensor unit adapted to sense at least one sensor parameter related to a golf player carrying out a stroke. 45
11. The golf diagnosis apparatus according to claim 10, wherein the sensor unit is adapted to sense at least one of the group consisting of a weight distribution acting on the feet of the golf player carrying out the stroke, and a weight distribution acting on different portions of a foot of the golf player carrying out the stroke. 50
12. The golf diagnosis apparatus according to claim 11, wherein the sensor unit is integrated in a sole for insertion into a golf shoe.
13. The golf diagnosis apparatus according to any one of claims 1 to 12, wherein the sensor unit comprises at least one of the group consisting of a pressure sensitive platform, a mat, and a pad.
14. A golf equipment device, the golf equipment device being adapted for mounting at least a part of a golf diagnosis apparatus for evaluating a performance, particularly a stroke, of a golf player captured by an image acquisition device.
15. The golf equipment device according to claim 14, realized as at least one of the group consisting of a golf bag, a golf caddy, a golf cart, a golf glove, a golf shoe, a golf suit, a golf club, and a golf cap.
16. The golf equipment device according to claim 14 or 15, the golf equipment device being adapted for mounting the golf diagnosis apparatus at such a height that the mounted golf diagnosis apparatus is located, in normal use, at an anatomically appropriate position for a golfer.
17. The golf equipment device according to any one of claims 14 to 16, the golf equipment device being adapted for mounting, as the part of the golf diagnosis apparatus, at least one of the group consisting of the image acquisition device, a power supply unit for supplying at least a part of the golf diagnosis apparatus with electrical energy, an optical display unit for displaying golf diagnosis related information, a user interface unit for allowing a user to communicate with at least a part of the golf diagnosis apparatus, a sensor unit for sensing at least one golf diagnosis related sensor parameter, a stroboscope unit for generating pulses of electromagnetic radiation, and a data evaluation unit for evaluating golf diagnosis related data.
18. A golf diagnosis system, comprising a golf diagnosis apparatus according to any one of claims 1 to 13; a golf equipment device according to any one of claims 14 to 17; wherein at least a part of the golf diagnosis apparatus

in mounted on the golf equipment device.

- 19.** The golf diagnosis system according to claim 18, comprising at least one component, particularly a power supply unit, which is functionally shared by the golf diagnosis apparatus and the golf equipment device. 5
- 20.** A method of mounting a golf diagnosis apparatus for evaluating a performance, particularly a stroke, of a golf player captured by an image acquisition device, the method comprising mounting at least a part of the golf diagnosis apparatus on a golf equipment device. 10

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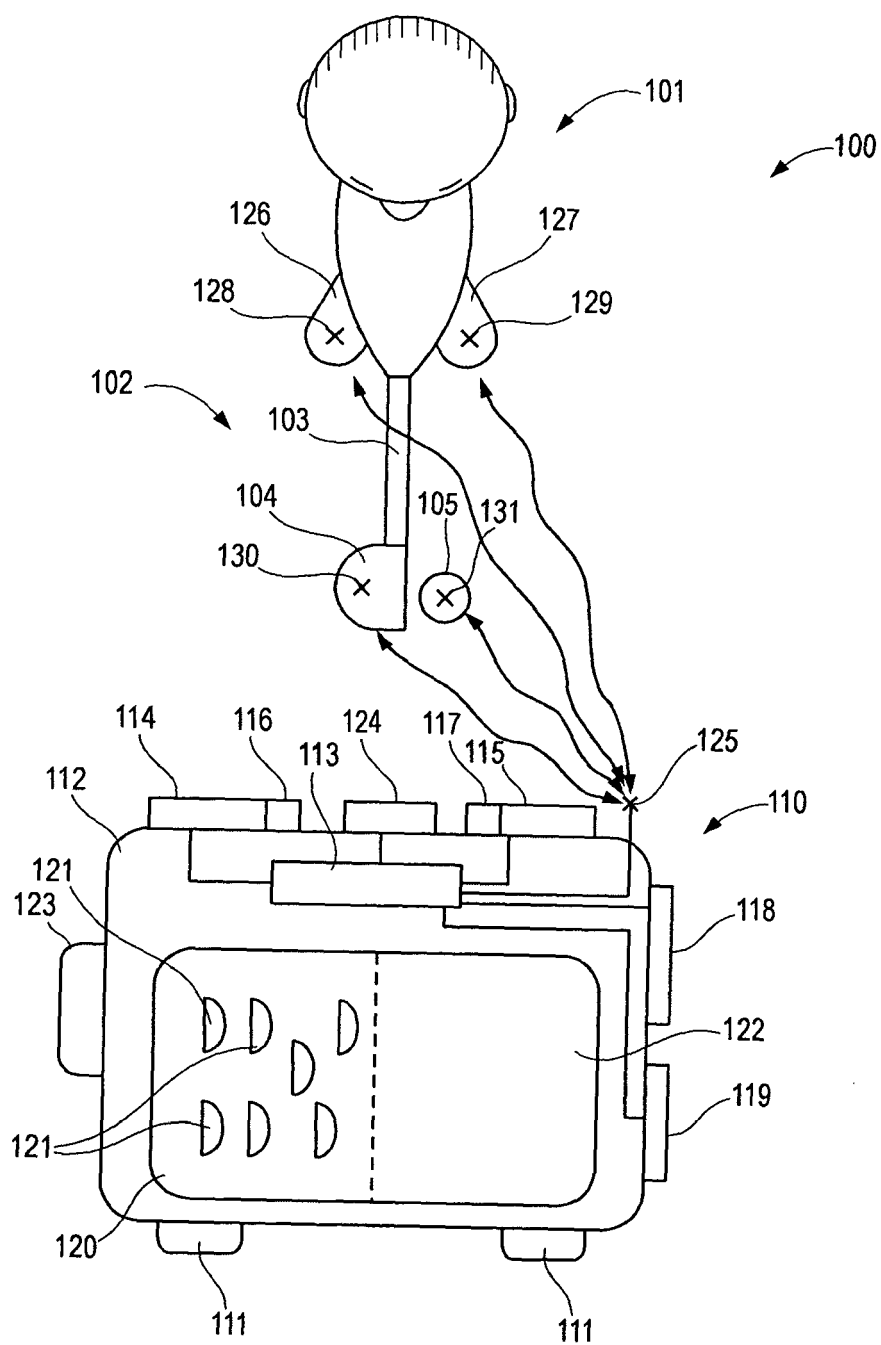


Fig. 1

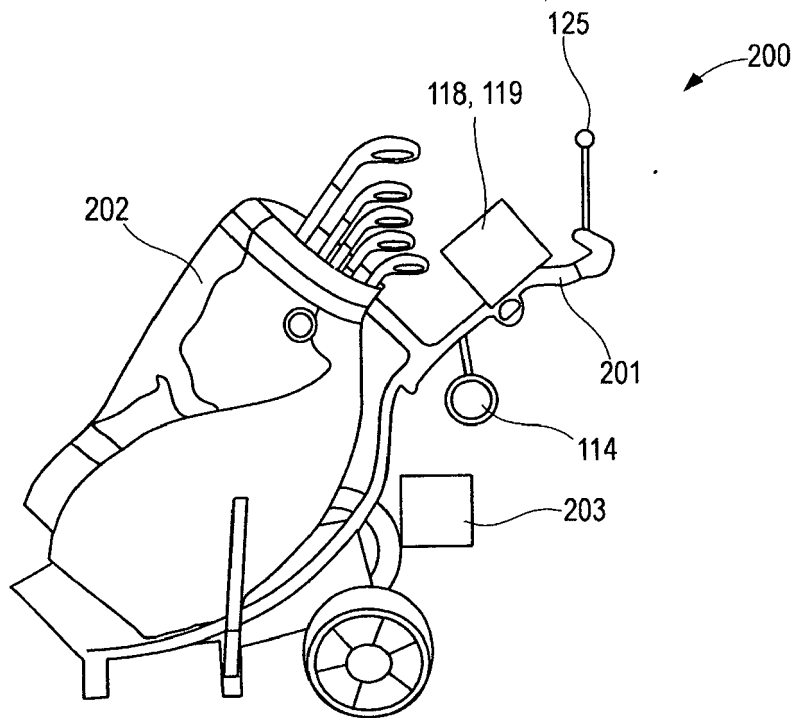


Fig. 2

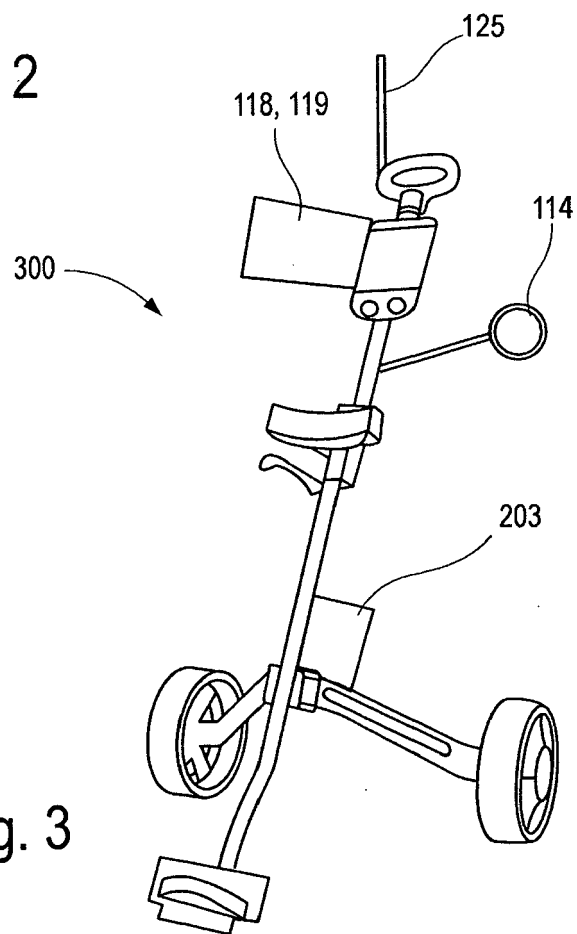


Fig. 3

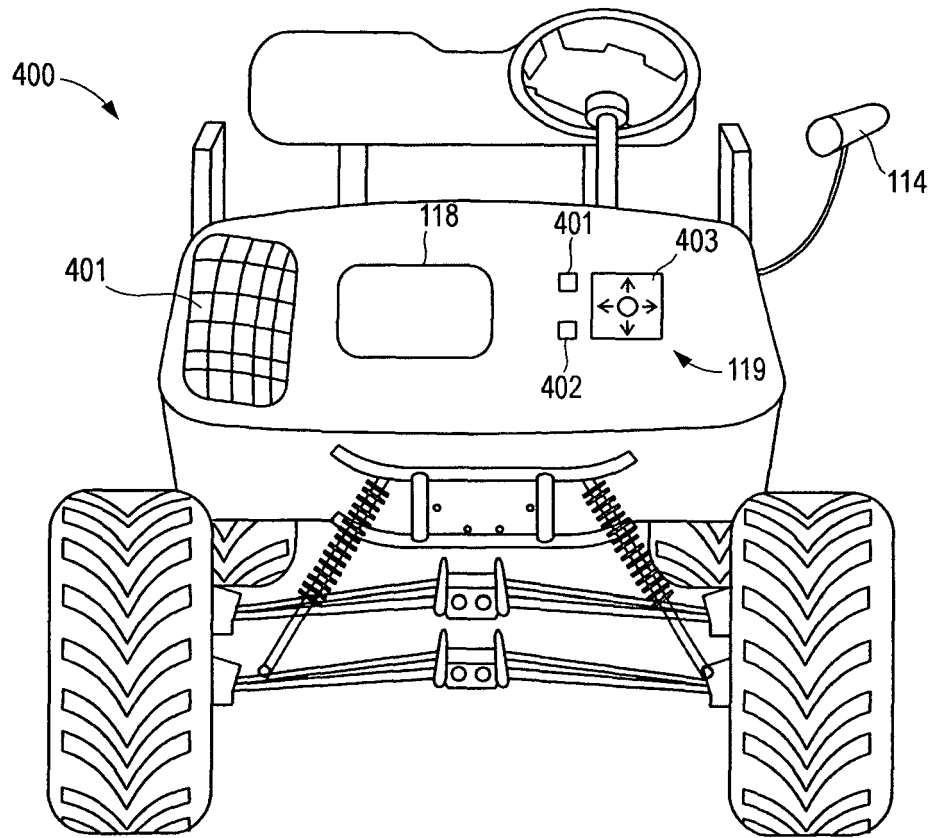


Fig. 4

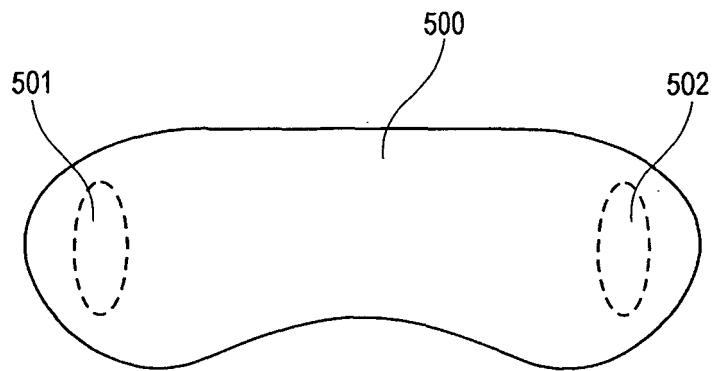


Fig. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 06 00 5267

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 907 819 A (JOHNSON LEE EDWARD [US]) 25 May 1999 (1999-05-25) * column 3, lines 27-68 - column 4, lines 1-38 * * column 8, lines 6-28; figures * -----	1-10, 14-20	INV. A63B55/00 A63B69/36 A63B24/00
X	US 5 111 410 A (NAKAYAMA MIZUO [JP] ET AL) 5 May 1992 (1992-05-05) * column 2, lines 30-34 - column 3, lines 52-67 * * column 5, lines 44-66 - column 6, lines 2-49 * * column 13, lines 8-68; figures * -----	1-4, 10-20	
X	US 5 792 000 A (WEBER LEO L [US] ET AL) 11 August 1998 (1998-08-11) * column 1, lines 60-28 - column 2, lines 1-15,60-68 * * column 3, lines 1-68; figures * -----	1-5,7,8, 10,14-20	
X	US 4 239 227 A (DAVIS LEIGHTON I [US]) 16 December 1980 (1980-12-16) * column 2, lines 44-68 - column 4; figures * -----	1-5,10, 14-20	TECHNICAL FIELDS SEARCHED (IPC) A63B G06T G09B
X	US 6 142 437 A (WILKINS JR GUY [US]) 7 November 2000 (2000-11-07) * column 1, lines 11-17,34-36 - column 2, lines 35-45; figures 3,4 * -----	1,2, 14-18,20	
A	US 2004/106460 A1 (LEE NATHAN J [US] ET AL) 3 June 2004 (2004-06-03) * paragraphs [0004], [0017], [0020], [0030], [0078], [0079] * -----	1-20	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 7 May 2007	Examiner Teissier,Sara
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

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ON EUROPEAN PATENT APPLICATION NO.**

EP 06 00 5267

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07-05-2007

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5907819	A	25-05-1999	US 5638300 A	10-06-1997
US 5111410	A	05-05-1992	NONE	
US 5792000	A	11-08-1998	CA 2210946 A1	25-01-1998
			DE 19732151 A1	29-01-1998
			GB 2315420 A	04-02-1998
US 4239227	A	16-12-1980	NONE	
US 6142437	A	07-11-2000	NONE	
US 2004106460	A1	03-06-2004	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 20050026710 A1 [0003]
- US 20050026710 A [0003]