



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
16.04.2008 Bulletin 2008/16

(51) Int Cl.:
A63B 69/00 (2006.01) A63B 63/00 (2006.01)

(21) Application number: **06794064.3**

(86) International application number:
PCT/ES2006/000400

(22) Date of filing: **13.07.2006**

(87) International publication number:
WO 2007/010063 (25.01.2007 Gazette 2007/04)

(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

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(30) Priority: **20.07.2005 ES 200501662 U**

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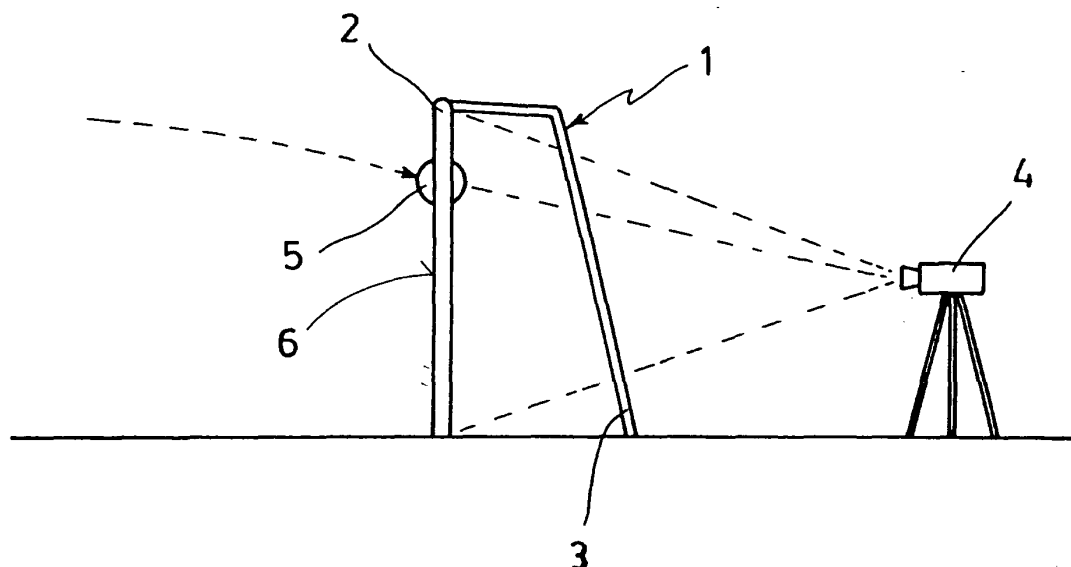
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(54) **DEVICE FOR CHECKING AND ASSESSING SPORTS-RELATED ACTIONS**

(57) Sport action control and assessment device, particularly one that is applicable to competition games using a ball (5) that must cross or hit an enclosed space (6) to simulate or obtain a game point, wherein enclosed space (6) is controlled by means (4) sensing the presence of ball (5), which detect and hold in an inspectionable memory the spatial characteristics of the point at which

ball (5) has reached and crossed said enclosed space (6). Enclosed space can allow the free passage of the ball, like the corresponding goal posts used in football, handball, hockey, water polo and rugby or not allow it, like in tennis and fronton. The sensory optical means are electronic apparatuses such as photoelectric, photographic, video cameras, scanner or photoelectric cells.

FIG. 1



Description

[0001] This invention relates to a sport action control and assessment device, intended for assessing the results obtained in sport action training, this being understood to mean taking penalties and free shots in football, handball, hockey, water polo, rugby, etc, without excluding actions of other sports such as tennis, throwing javelin and weight in athletics, etc.

[0002] Being able to obtain an assessment of the results using the invention device means that this assessment can be used as a basis for relative information on each player's technique when performing a certain sport activity, so that possible deficiencies in performing these actions can be corrected and improved and said assessment can be used as a model for inexperienced players, when the information collected corresponds to a top class player.

[0003] Nevertheless, the fundamental advantage of the information obtained using the invention device is the practical application of serving as sufficient basis for the team captain or trainer to choose, out of the team players, the one who can perform the penalty, free shot and corner, etc., with the greatest guarantee of success.

[0004] In order to obtain the object specified at the beginning, the solution has been adopted whereby the position of the ball or the disk or similar thrown by a particular player with respect to a goal post or another reference means that is either real or substitute.

[0005] According to the above solution, the sport activity control and assessment device has been developed, which consists of an enclosed space where the passage across it of a ball or the like determines a game point, with the enclosed space being controlled by optical means that detect the passage of the ball or the like, which passage is held in inspectionable memory by the spatial characters of the point where the ball or the like crossed said enclosed space.

[0006] A feature of the invention, according to one of the embodiments thereof, consists in that the enclosed space is such that it allows the free passing of the ball or the like.

[0007] Another feature of the invention, according to another embodiment thereof, is that the enclosed space does not allow the free passage of the ball or the like, as it would be the case of fronton or tennis, and it is formed by an element from the group comprising boards and reticular structures, which include in their surface the sensors which detect the point of impact of the ball or the like.

[0008] Another feature of the invention is that the information stored in the inspectionable memory can be observed using a medium from the group comprising a paper support, a video screen, a transparency, a hologram or another suitable medium, considered either individually or in their possible combinations.

[0009] Another feature of the invention, according to one of the possible embodiments thereof, is the fact that the enclosed space is the vertical plane delimited by the

frame of a goal post from the group used in football, handball, hockey, water polo and rugby.

[0010] Another feature of the invention, according to another possible embodiment excluding the previous one, consists in that the enclosed space is a vertical plane which is coplanar with a dividing net of the field and said space is larger than this net in at least one of its dimensions, such as in the case of tennis and volleyball.

[0011] Another preferred feature of the invention lies in the fact that the device includes means that collect the date and time of the event, the identification of the person performing the action, the position of the ball or the like, the distance from the goal post, etc., the data being collected and processed by means of a computer system, which can accumulate the registered sport actions for one or more players over time (weekly, monthly, annually, etc.) and produce all kinds of statistics.

[0012] Another feature of the invention, according to one of the possible embodiments thereof, consists in that the sensory means comprise an electronic apparatus capable of detecting the presence of the ball or the like at a point in the vertical, enclosed space, determining the position thereof in said space and holding it in an inspectionable memory.

[0013] Another feature of the invention consists in that the sensory means comprise a sensor and/or ray grid created in the latter case by a plurality of emitters and receivers, for example photoelectrics, of said rays which are arranged in the periphery of the enclosed vertical space.

[0014] Finally, the invention takes into account the fact that the electronic apparatus consists in a group comprising a photoelectric camera, a photographic camera, a video camera and a scanner, either alone or in the possible combinations thereof.

[0015] In order to facilitate the comprehension of the foregoing ideas, there follows a description of a preferred embodiment of the invention, with reference to the accompanying illustrative drawings, in which:

Figure 1, represents, schematically in a side elevation view, a football goal post showing the instant when a ball enters said goal post and the position of an electronic apparatus that captures the position thereof with respect to the goal post frame.

Figure 2, represents, also schematically, in front elevation, a post goal wherein the electronic apparatus is formed by a plurality of sensors which, mounted in the frame of the goal post, form a scanner.

Figure 3, represents, schematically, the invention device shown in a block diagram and with two digital cameras covering the space of a football goal post indicated in the top plane.

[0016] In figures 1 and 2, which are schematic, neither the goal-keeper nor the net closing off the goal post 1 are shown. Frame 2 of goal post 1, with its supports 3, is included in the field of action of an electronic apparatus

4, for example a digital camera which, in the enclosed space 6 limited by frame 2 of goal post 1, will capture the position of the ball 5 launched by the player whose sporting action is being checked.

[0017] In case of Figure 2, frame 2A of the goal post 1A has in this inner perimeter a plurality of sensors 7, protected against the action of the ball and the atmospheric elements.

[0018] In both figures 1 and 2, the enclosed space 6 wherein it is detected the entrance point of a ball 5 is the vertical plane delimited by frame 2, 2A of the goal post 1, 1A. In another embodiment, which is not shown, said enclosed space is made up of a board with the same surface or a resistant reticular structure, which would serve as support of sensors which, in this case, would detect the impact of the ball or the like avoiding the passage of the ball.

[0019] With the information collected in the memory of electronic apparatus 4, graphs, photographs, transparencies, video cinematographic projections, holographs, etc. can be produced, which prove to be very useful for training players and helping them specialize.

[0020] In order to achieve the proposed aims of the detection, two-dimensional location and communication with a computer system of the entry of a standard football ball through a standard football goal post, a device has been created that is based on a data acquisition and video processing system.

[0021] Figure 3 represents a preferred embodiment of the object of the invention showing a standard football goal post 1B, in a top plane view. On one side and at the back of said goal post 1B two digital cameras CA and CB are placed orthogonally, which are connected to respective interfaces 1A and 1B comprised in an electronic module ME that includes a like number of processing units UPA and UPB for the respective cameras CA and CB. Processing units process UPA, UPB, by means of a communications interface IC, are connected to a PC computer. Electronic module ME has a power supply FA connected to a 230 V power network at AC 50 Hz.

[0022] In the case of Figure 3, there is a standard football goal post 1B where an attempt is made to detect, locate over two dimensions and communicate to a computer system, the entry of a standard ball 5 through standard space 2B of a football goal post 1B.

[0023] The dimensions of standard frame 2A of this standard goal post 1A are 732 x 244 cm, the ball is 21.6 to 22 cm in diameter and the resolution of the electronic system is approximately 10 points vertically and 30 points horizontally, also approximately.

[0024] For optimum system performance it is advisable to take the following requirements into account:

- Sufficient contrast between the ball and the background of the captured image, whereby it is recommended that ball 5 be black or white.
- Absence of other mobile elements in the target line of goal post 1A.

[0025] Electronic module ME obtains and processes the lateral goal post images captured by camera CA, in order to detect the entry of standard ball 5 in standard goal post 1B and produce a synchronism signal, after processing the images captured by camera CB, in order to determine the co-ordinates, in vertical plane 6 limited by the target line and frame 2B of the goal post, of the point of entry of ball 5 and, via a communications interface IC, send this information to the PC computer.

[0026] Video camera CA, which captures the lateral image of goal post 1A, has a video signal output made up of 50 frames by second or more, has a 60° angle of vision and is placed 2.11 m from the side of goal post 1B and is 1.22 m off the ground.

[0027] Video camera CB, which captures the rear image of goal post 1B, has a video signal output made up of 50 frames per second or more, has a 60° angle of vision and is placed 6.33 m from the target line of standard frame 2B of goal post 1B and is 1.22 m off the ground.

[0028] The PC computer is the computer system with which said electronic module ME carries out the following functions:

- Register the co-ordinates received to be subsequently processed for statistics, viewing, storage and printing.
- Act as an interface with the user to synchronize the system with shooting the ball at the goal.

[0029] With this system, developed using the invention device, practical training results are provided in an objective manner, contrary to what occurs at present where the practical training results are assessed subjectively, since this is the only possible method at present, and they are not at all accurate.

[0030] With the invention device assessments can be made for situations or parameters such as: the ball's distance from the goal post, the foot used for taking the penalty, the position of the ball, kicking or throwing the ball with or without a barrier, etc.

[0031] Finally, it is worth mentioning that all the data is stored, so that performance graphs can be produced at any time, either on an individual or collective basis, without the trainer necessarily being present.

Claims

1. Sport action control and assessment device, particularly one applicable to competition games using a ball (5) or the like that must cross or impact an enclosed space (6) to simulate or obtain a game point, **characterized in that** an enclosed space (6) is controlled by means (4, 7) sensing the presence of ball (5) or the like which detect and hold in an inspectionable memory the spatial characters of the point where said ball (5) or the like has crossed said enclosed space (6).

2. Sport action control and assessment device according to claim 1, **characterized in that** the enclosed space (6) allows the free passage of the ball (5) or the like. 5
3. Sport action control and assessment device according to claim 1, **characterised in that** the enclosed space does not allow the free passage of the ball or the like and is formed by an element from the group comprising boards and reticular structures, which include in their surfaces said sensory means which detect the point of impact of the ball or the like in said enclosed space. 10
4. Sport action control and assessment device according to any of claims 1 to 3, **characterised in that** the information stored in the inspectionable memory can be observed with a medium from the group comprising a paper support, a video screen, a transparency and a hologram, considered either individually or in their possible combinations. 15 20
5. Sport action control and assessment device according to any of claims 1 to 4, **characterized in that** said enclosed space is the vertical plane (6) delimited by frame (2, 2A, 2B) of a goal post (1, 1A, 1B) from the group of goal posts used in football, handball, hockey, water polo and rugby. 25
6. Sport action control and assessment device according to any of claims 1 to 4, **characterized in that** said enclosed vertical space is coplanar with a dividing net of the football field and it is larger than said net at least in one of its dimensions. 30 35
7. Sport action control and assessment device according to any of claims 1 to 6, **characterised in that** it includes means that collect, among other data, the date and time of the event and the identification of the player performing said action. 40
8. Sport action control and assessment device according to any of claims 1 to 7, **characterized in that** said sensory means consist of an electronic apparatus (4) capable of detecting the presence of ball (5) or the like across a point in said enclosed space (6), determining the position of said point in said enclosed space (6) and holding it in an inspectionable memory. 45 50
9. Sport action control and assessment device according to any of claims 1 to 8, **characterized in that** said sensory means consist in a sensor and/or ray grid, said ray grid being created by a plurality of emitters and receivers (7) of said rays arranged in the periphery of the enclosed space (6). 55
10. Sport action control and assessment device according to claim 8, **characterized in that** electronic apparatus (4) is one from the group comprising a photoelectronic camera, a photographic camera, a video camera and a scanner, considered either individually or in their possible combinations.
11. Sport action control and assessment device according to claim 5, **characterized in that** said sensory means comprise a first digital video camera (CA) arranged to capture a lateral image of goal post (1B), a second digital video camera (CB) arranged to capture a rear image of goal post (1B) and an electronic module (ME) that receives the images provided by said digital video cameras (CA, CB) and which can process said images and determine the co-ordinates of the point of entry of a ball (5) in goal post (1B) through crossable enclosed space (6) limited by the frame of said goal post (1B).

FIG. 1

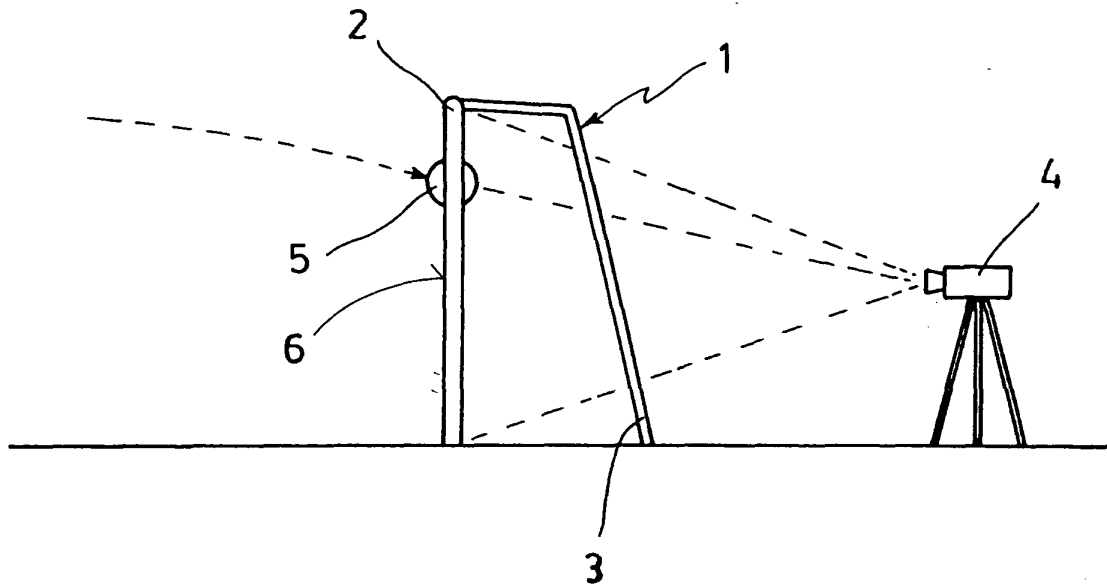


FIG. 2

