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(54) **Method and system for detecting an offside situation**

Verfahren und System zur Detektion einer Abseitssituation

Procédé et système pour détecter une situation de hors-jeu

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(56) References cited:
EP-A- 1 199 089 **EP-A- 1 538 456**
WO-A-97/20449 **WO-A-2006/097357**
WO-A-2006/111928 **BE-A6- 1 015 552**
US-A1- 2006 178 235

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Description

[0001] The present invention relates to a method and a system for detecting a contact with a ball by a player in games and sports, such as for detecting an offside situation during a game of football (soccer). W097/20449 relates to a method for reproducing the sound environment during a sporting event involving a ball.

[0002] In football usually at least two referee's (a referee and a linesman) are to referee the play. An important rule to be observed and refereed is offside. Offside may occur if a player, usually an offensive player, of a first team is located between the goalkeeper and all the other players of the second team. If another player of the first team passes the ball to the first-mentioned player at the moment that the first-mentioned player is between the goalkeeper and the other players, the first-mentioned player is deemed to be offside. The linesman is to detect such a situation and to raise the flag to indicate to the referee that the first-mentioned player is offside.

[0003] In order to determine whether the first-mentioned player is offside, the linesman needs to determine a position of the first-mentioned player of the first team with respect to a position of the players of the second team exactly at the moment when another player of the first team kicks the ball towards the first-mentioned player.

[0004] However, usually, the ball is not near the first-mentioned player and therefore, the linesman cannot see the first-mentioned player and the ball at a single glance. Therefore, the linesman commonly keeps the ball in sight and as soon as the ball is kicked, he changes his sight towards the first-mentioned player. Although the change of sight occurs in a very short period, e.g. several milliseconds, the position of the first-mentioned player and/or a number of the players of the second team may have changed considerably. Further, other players may obstruct the sight of the kick of the ball. Also, depending on the position of the referee with respect to the first-mentioned player of the first team and some of the players of the second team, it may be that the linesman misjudges the relative position of the players. As a consequence of the aforementioned reasons and possibly other reasons, the linesman often misjudges and, when in doubt, calls for offside, although the first-mentioned player was actually not offside. This problem is also addressed in BE1015552, which discloses an electronic chip in a ball programmed to detect pressure changes and the shock resulting from the contact of a player with the ball. The chip is in contact with a transmitter/receiver which signals the referee(s) by a beep through an ear piece or by other means.

[0005] It is an object of the present invention to provide a method and system for assisting the referee and linesman in detecting a contact with the ball by a player, such as for correctly judging offside.

[0006] The object is achieved in a method according to claim 1.

[0007] When a player kicks the ball, a sound vibration is generated in the ball. This sound vibration is sensed. However, also other events may generate a sound vibration in the ball. Therefore, any sensed sound signal is processed by comparing it with a predetermined sound signal of a kick of the ball. If it is determined by the processing that a sensed sound is the sound of a kick of the ball, the detection signal is generated. Thus, the moment of determination of kicking the ball is not dependent on the subjective observation of a person, but is objectively determined by electronic means.

[0008] The above method allows the referee to detect a position of a second player at the moment of observation of the observable signal. As used herein, a referee may be the actual referee or may be a linesman or may be any other person observing the game.

[0009] As a detection signal is generated and converted to an observable signal, the referee may keep primarily a possibly offside player in sight, instead of the ball. There is no need for the referee to observe the (kick of the) ball. As used herein, the term 'kick of the ball' is intended to refer to any kind of contact with the ball by a player that may or will lead to offside. At the moment that a player kicks the ball, the observable signal is generated. When perceiving the observable signal, the referee keeping the possibly offside player in sight can immediately determine whether the player is at that moment, i.e. the moment of the kick of the ball, actually offside.

[0010] In an embodiment a further referee may observe the ball and, using a suitable system, the further referee may activate a detection signal generator, e.g. by pushing a button, for generating the detection signal.

[0011] In an embodiment of the method generating a detection signal comprises compiling the detection signal, a content of the detection signal comprising at least one element of the group comprising detected sound information data and a ball identification code. Thus, the detection signal may be compiled from a number of kinds of information. For example, if a number of balls may be used, each ball may comprise its own identification number in order to prevent that a false or erroneous observable signal is generated as a consequence of a detection signal generated in another ball. The detected sound information may be used to control a level of the observable signal thereby providing information to the referee how hard the ball was kicked. If only a soft kick was given, the referee may determine that the ball was not intended to be kicked towards the possibly offside player presuming that the distance between the ball and the offside player is large.

[0012] In an embodiment of the method the detection signal is generated in the ball. In this embodiment, the method comprises wirelessly transmitting the detection signal from the ball to the signaling system.

[0013] In an embodiment of the method the observable signal comprises a signal selected from the group comprising an audible signal, a visual signal, and a tangible signal. A sound signal may be provided to the referee.

Likewise, a light signal may be provided. Further, likewise, a tangible signal may be provided to the referee. In an embodiment two or more of these signals are provided to the referee.

[0014] In an embodiment, wherein the observable signal comprises a tangible signal, the step of generating an observable signal comprises generating a vibration in an object to be held by the referee, the object in particular being a flag handle. Also other signal generators may be arranged in the flag handle, such as an audible signal generator and/or a visible signal generator.

[0015] The present invention further provides a system according to claim 8 for performing the method.

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[0017] In an embodiment, the detection signal generator is arranged in the ball.

[0018] The detection signal generator comprises a sound sensing means, in particular a microphone; and a sound processing means coupled to the sound sensing means for processing a sound signal received from the sound sensing means in order to determine whether the ball is kicked.

[0019] In an embodiment, the detection signal transmission system is a wireless transmission system, in particular operating at a frequency that is suitable to transmit over a distance of at least the distance of a diagonal of a play field. Considering that the diagonal is the largest possible distance between the ball and a referee, a wireless signal transmitted from the ball should at least be carried over such a distance. In practice, a frequency of 433 MHz appeared to be suitable. A transmission frequency may also be selected upon consideration of a requirement of a license to use such a frequency.

[0020] In an embodiment the signaling system comprises a flag, the observable signal generator being arranged in a part of the flag, in particular in a flag handle.

[0021] In an embodiment the signaling system comprises as an observable signal generator at least one of an audible signal generator, a visible signal generator and a tangible signal generator.

[0022] It is noted that the method and system according to the present invention may as well be employed in determining a handball, i.e. a foul by touching the ball with a hand. The method and system may also be employed for assisting a referee in determining which player was the last player to touch the ball before the ball went outside the play field.

[0023] Hereinafter, the invention is elucidated with reference to the appended drawings showing non-limiting embodiments and wherein:

Fig. 1A illustrates an embodiment of a method for generating a detection signal in accordance with the present invention;

Fig. 1B illustrates an embodiment of a method for generating an observable signal in accordance with the present invention;

Fig. 2A schematically shows a ball for use in an em-

bodiment of a system according to the present invention;

Fig. 2B schematically shows a signaling system for use in an embodiment of a system according to the present invention;

Fig. 3 shows a graph of a sound signal produced by a ball when kicked;

Fig. 4 schematically illustrates a ball in accordance with an embodiment of the present invention; and

Fig. 5 schematically shows a handle of a flag for use in an embodiment of the present invention.

[0024] In the drawings, same reference numerals refer to same elements.

[0025] In Fig. 1A, a method is illustrated as a block diagram comprising a number of method steps. Initially, a system for performing the method may be in a power safe mode 101 in order to prevent a low energy level, when the system is to be used.

[0026] Then, the system is started in step 102. The system may be started by switching the system on using a suitable means, such as a start button or a remote controller. In an embodiment, the system may be automatically started, when it is detected that apart of the system, e.g. a ball, is moved.

[0027] In the method according to the present invention, a kick against a ball is to be detected and to be signaled to a referee, in practice usually a linesman of a football (soccer) game. When the ball is kicked, a sound is produced by the ball.

[0028] The sound is sensed by a suitable sensor, such as a microphone, as shown by step 103 in Fig. 1A.

[0029] The sound sensing means, e.g. the microphone, may be located at any suitable location. In an embodiment, the sound sensing means is arranged in the ball. In such an embodiment, a sound level of the sound produced by the ball is much higher than the sound level of a sound produced in the surroundings, e.g. by the players and/or spectators. Hence, the sound produced by the ball is easily distinguishable.

[0030] The sensed sound may be the sound produced due to a kick of the ball, including a header or a contact by a knee or any other contact of a player with the ball, i.e. any contact with a player that may lead to offside. However, the sensed sound may as well be produced due to any other occurrence that may not lead to offside, such as a sound when the ball hits the ground. Therefore, in step 104, the sensed sound is processed in order to determine whether the sound was due to a kick. For example, the sensed sound may be digitized using a suitable analog-to-digital (A/D) converter and processed by a suitable microcontroller. The processing includes comparing the sensed signal with a predetermined signal, which predetermined signal is the signal of a kick of the ball. The processing may include, additionally, spectral analysis of the sensed sound signal. Also other processing techniques may be employed.

[0031] Based on the processing results, in step 105, it is determined whether the ball was kicked, or not. If it is determined that the ball was kicked, a detection signal is generated in step 106. If it is determined, in step 105, that the ball was not kicked, the method returns to step 103.

[0032] Referring to Fig. 1B a signaling system for use in an embodiment of the method according to the present invention may be in a power safe mode as indicated by method step 111. In step 112, the signaling system may be activated from the power safe mode by pushing a button or by any other suitable means.

[0033] Once activated, the signaling system is configured to receive a detection signal as generated in accordance with the present invention, for example in accordance with embodiment as illustrated by Fig. 1A.

[0034] Thus, in steps 113 and 114, the signaling system is sensing whether a detection signal is received. If it is determined that the detection signal is received, an observable signal is generated. Such an observable signal may be an audible signal, a visible signal or a tangible signal, or a combination thereof. If it is determined that no detection signal is received (step 114), the method returns to step 113.

[0035] Fig. 2A shows an embodiment of a system for generating a detection signal. The system is comprised in a ball Ba. The system comprises an energy source ES_{Ba} , a sensing means SM, a processing means PM and a transmission means TM.

[0036] The energy source ES_{Ba} is configured to supply power to the other components. The energy source ES_{Ba} may be any kind of suitable energy source, for example a battery, possibly a rechargeable battery. As the system is comprised in a ball Ba, the battery may advantageously be a small battery, e.g. a coin-shaped battery.

[0037] The sensing means SM may comprise a microphone for sensing a sound signal produced by the ball Ba, when it is kicked. Additionally, the sensing means SM may comprise an acceleration sensor for measuring an acceleration of the ball Ba. Other suitable sensing means SM may as well be employed, in combination. The sensing means SM outputs a sensed sound signal, and the sensed signal is supplied to the processing means PM.

[0038] The processing means PM may process the sensed signal for determining from the sensed signal whether the ball Ba was kicked. In an embodiment, the processing means PM solely processes the sensed signal to prepare the sensed signal for transmission, thereby lowering power consumption of the processing means PM. The processed sensed signal is output by the processing means PM and is supplied to the transmission means TM.

[0039] The transmission means TM receives the output of the processing means PM and transmits the output, for example through a wireless transmission channel. If the processing means PM solely prepare the sensed signal for transmission, the transmission means TM contin-

uously transmits the output of the processing means PM. In such an embodiment, the sensed signal is further processed at the receiver side, e.g. the signaling system, as is explained hereinafter. In an embodiment, wherein the processing means PM solely outputs a detection signal, when it is determined that the ball Ba was kicked, the transmission means TM only transmits now and then, i.e. at times that a detection signal is output by the processing means PM. Thus, in such an embodiment, the power consumption of the transmission means TM may be relatively low.

[0040] Referring to Fig. 2B, a signaling system may be comprised in a flag F1 of a linesman. The signaling system may comprise a receiver means RM, a controller means CM, an actuator Ac and an energy source ES_{F1} for supplying power to the aforementioned components of the signaling system.

[0041] The receiver means RM is configured to receive a signal transmitted by the system of Fig. 2A. The signal may be a signal comprising a sensed signal and/or a detection signal as above described.

[0042] The controller means CM is configured to receive the received signal from the receiver means RM. The controller means CM determines from the received signal whether the ball Ba (Fig. 2A) was kicked. In case the received signal comprises a detection signal, the controller means CM may directly determine that the ball Ba was kicked. If the received signal does not comprise a detection signal, but does comprise the sensed signal, the controller means CM may comprise a processor for processing the sensed signal in order to determine whether the ball Ba was kicked based on the sensed signal. If it is determined that the ball Ba was kicked, an actuation signal is transmitted to the actuator Ac, which in response generates an observable signal. The actuator Ac may be a light output device, e.g. a lamp or LED, a sound generating device or a vibration generating device for generating a tangible signal, for example. A vibration generating device may be an eccentric motor means, for example.

[0043] Fig. 3 shows a graph of a sound signal produced by a ball when the ball is kicked. The horizontal axis represents time in milliseconds; the vertical axis represents a sound level (amplitude) on a logarithmic scale. Based on the amplitude and/or frequency content of the sound signal, e.g. using spectral analysis, it may be determined what caused the signal, in particular whether the sound signal was due to a kick against the ball.

[0044] Fig. 4 shows a cross-section of a ball Ba in accordance with an embodiment of the present invention. The ball Ba comprises an inner ball IB and an outer ball OB. Between the inner ball IB and the outer ball OB a detection system circuit DSC is positioned. The detection system circuit DSC may comprise the components as shown in Fig. 2A, i.e. an energy source ES_{Ba} , a sensing means SM, a processing means PM and a transmission means TM.

[0045] The detection system circuit DSC may be ar-

ranged on a flexible printed circuit board (PCB) such that the PCB may assume a rounded/spherical shape in accordance with the round/spherical shape of the ball. In an embodiment, the PCB is not flexible, but is preshaped in accordance with the shape of the ball Ba. The energy source, e.g. a coin shaped battery, may be arranged on a first side of the PCB and preferably positioned between the outer ball OB and the PCB. The electronic components, e.g. a sensing means, a processing means and/or a transmission means, are preferably arranged at a second, side of the PCB, the second side being opposite to the first side, i.e. between the inner ball IB and the PCB. Thus, the battery may protect the electronic components against damage due to a kick at the ball Ba.

[0046] The transmission means of the detection system circuit DSC may comprise an antenna, in particular a loop antenna, for transmitting a detection signal or a detected signal. The loop antenna may be substantially two-dimensionally shaped and arranged on the PCB. The dimensions of the loop antenna may be, for example, 35 x 20 mm or 50 x 30 mm. The smaller antenna having dimensions 35 x 20 mm has a suitable transmission range and may be preferred due to its dimensions. The larger antenna having dimensions 50 x 30 mm is relatively large, but may be preferred due to its relatively low energy consumption.

[0047] A motion detection element may also be comprised in the detection system circuit DSC. For example, a piëzo element may be arranged between the inner ball IB and the PCB. When the ball Ba starts to move, pressure is applied to the piëzo element, which in response outputs an electrical signal. The electrical signal may be employed to indicate that the ball Ba is moving and the detection system is to leave a power safe mode (Fig. 1A) and to start.

[0048] It is noted that regulations may limit a weight of the ball Ba. Further, a relatively large weight at one side of the ball Ba may influence the behaviour of the ball Ba. Therefore, suitable lightweight components may be used. For example, the electronic components may be made from SMD components. In such a practical embodiment, the weight of the DSC may be about 10 g.

[0049] Fig. 5 shows a flag handle FH of a flag to be used by a linesman, i.e. one of the referee's, during a football (soccer) match. The flag handle FH comprises a signaling system in accordance with the present invention and may, for example, be used in combination with the ball Ba as illustrated in Fig. 4.

[0050] Referring to Fig. 5, the flag handle FH comprises a battery level indicator LI indicating an energy level of a battery comprised in the flag handle FH and/or a energy level of the battery comprised in the ball Ba in order to prevent that either battery energy level will become too low for operation during a match.

[0051] The flag handle FH may further comprise a switch SW for switching the signaling system on or off. The switch SW may be a push button, for example. Thus, the linesman may push the switch SW, when a possible

offside situation occurs such that the signaling system only provides the observable signal in such a situation instead of during the whole match.

[0052] The flag handle FH may further comprise a ball selector switch BS. Presuming that the flag handle FH is to operate with the ball Ba as shown in Fig. 4, each ball Ba may have an identification code. The identification code may be transmitted with the transmitted signals. The use of an identification code prevents that signals from any other ball, not used in the match, are received and interpreted, which could lead to misjudgments. The ball selector switch BS allows to use the flag and flag handle FH in combination with a number of balls.

[0053] In order to enable the signaling system of the flag handle FH to be used in combination with a further number of balls, the flag handle FH may comprise a memory reader MR e.g. comprising a subscriber identity module (SIM) card reader. The memory reader MR may receive and read a memory card SIM. On the memory card one or more identification codes of a number of corresponding balls is stored. In combination with the ball selector switch SW, for example, the identification code of the ball to be used in the match may be selected from the memory card.

[0054] The method and system according to the present invention may as well be advantageously used for assisting a referee to determine which player had the last contact with the ball. The method and system allow determining whether an apparent contact with the ball was an actual contact with the ball, since the method and system may indicate when there is a contact with the ball. Similarly, the method and system may assist in detecting a handball, i.e. a contact of a hand with the ball. Such a contact detection method and system may as well be employed for assisting a referee in other games and sports, such as volleyball.

[0055] Although detailed embodiments of the present invention are disclosed herein, it is to be understood that the disclosed embodiments are merely exemplary of the invention, which can be embodied in various forms. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the present invention in virtually any appropriately detailed structure. Further, the mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

[0056] Further, the terms and phrases used herein are not intended to be limiting; but rather, to provide an understandable description of the invention. The terms "a" or "an", as used herein, are defined as one or more than one. The term another, as used herein, is defined as at least a second or more. The terms including and/or having, as used herein, are defined as comprising (i.e., open language). The term coupled, as used herein, is defined as connected, although not necessarily directly.

Claims

1. Method for detecting a contact with a ball by a first player in games and sports, the method comprising:
 - sensing a sound signal produced by the ball (Ba);
 - processing the sound signal in order to determine whether there is a contact with the ball by the first player, wherein the processing includes comparing the sensed signal with a predetermined signal, which predetermined signal is the signal of a contact with the ball by a player;
 - if the processing determines that the ball is contacted by the first player, generating a detection signal;
 - supplying the detection signal to a signaling system; and
 - generating by the signaling system an observable signal to be observed by a referee, in response to receipt of the detection signal.
2. Method according to claim 1, wherein the method further comprises:
 - detecting a position of a second player by the referee at the moment of observation of the observable signal.
3. Method according to any of the preceding claims, wherein generating a detection signal comprises:
 - compiling a content signal of the detection signal, the content signal of the detection signal comprising at least one element of the group comprising detected sound information data and a ball identification code.
4. Method according to any one of the preceding claims, wherein the method further comprises:
 - generating the detection signal in the ball; and
 - wirelessly transmitting the detection signal from the ball to the signaling system.
5. Method according to any one of the preceding claims, wherein the observable signal comprises a signal selected from the group comprising an audible signal, a visual signal, and a tangible signal.
6. Method according to claim 5, wherein the observable signal comprises a tangible signal, and the step of generating an observable signal comprises:
 - generating a vibration in an object to be in contact with a body part of the referee, the object e.g. being a flag handle or a wrist device.
7. Method according to any of the preceding claims, wherein the contact with the ball by the first player is a kick of the ball.
8. System for detecting a contact with a ball by a first player in games and sports, the system comprising:
 - a detection signal generator comprising a sound sensing means (SM), in particular a microphone, for sensing a sound signal produced by the ball (Ba), and a sound processing means (PM) coupled to the sound sensing means for processing a sound signal received from the sound sensing means in order to determine whether there is a contact with the ball by the first player, wherein the processing includes comparing the sensed signal with a predetermined signal, which predetermined signal is the signal of a contact with the ball by a player, the detection signal generator generating a detection signal if the sound processing means determines that the ball is contacted by the first player;
 - a detection signal transmission system (TM) for supplying the detection signal from the detection signal generator to a signaling system;
 - an observable signal generator comprised in the signaling system for generating, in response to receipt of the detection signal, an observable signal to be observed by a referee.
9. System according to claim 8, wherein the detection signal generator is arranged in the ball.
10. System according to any one of the claims 8 - 9, wherein the detection signal transmission system is a wireless transmission system, in particular operating at a frequency that is suitable to transmit over a distance of at least the distance of a diagonal of a play field.
11. System according to any one of the claims 8 - 10, wherein the signaling system comprises a flag (FI), the observable signal generator being arranged in a part of the flag, in particular in a flag handle.
12. System according to claim 11, wherein the signaling system comprises as an observable signal generator at least one of an audible signal generator, a visible signal generator and a tangible signal generator.
13. System according to any one of the claims 8 - 12, wherein the signaling system is comprised in a flag handle (FH), wherein the flag handle comprises a ball selector switch (BS) to select a ball, based on its own ball identification code, comprised in the detection signal.
14. System according to claim 13, wherein the flag han-

die (FH) further comprises a memory reader (MR) for reading a memory storing one or more identification codes of a number of corresponding balls, wherein the identification code of the ball to be used in a match may be selected from the memory in combination with the ball selector switch.

15. System according to any of claims 8-14, wherein the contact with the ball by the first player is a kick of the ball.

Patentansprüche

1. Verfahren zum Erfassen eines Kontakts mit einem Ball durch einen ersten Spieler bei Spielen und Sport, wobei das Verfahren umfasst:

- Erfassen eines Schallsignals, welches von dem Ball (Ba) erzeugt wird;
- Verarbeiten des Schallsignals, um zu bestimmen, ob es einen Kontakt mit dem Ball durch den ersten Spieler gibt, wobei das Verarbeiten ein Vergleichen des erfassten Signals mit einem vorbestimmten Signal aufweist, wobei das vorbestimmte Signal das Signal eines Kontakts mit dem Ball durch einen Spieler ist;
- wenn das Verarbeiten ergibt, dass der Ball von dem ersten Spieler kontaktiert wurde, Erzeugen eines Erfassungssignals;
- Zuführen des Erfassungssignals zu einem Signalisierungssystem; und
- Erzeugen eines wahrnehmbaren Signals, welches von einem Schiedsrichter wahrgenommen wird, durch das Signalisierungssystem in Erwiderung auf einen Empfang des Erfassungssignals.

2. Verfahren nach Anspruch 1, wobei das Verfahren ferner umfasst:

- Erfassen einer Position eines zweiten Spielers durch den Schiedsrichter in dem Moment der Wahrnehmung des wahrnehmbaren Signals.

3. Verfahren nach einem der vorhergehenden Ansprüche, wobei ein Erzeugen eines Erfassungssignals umfasst:

- Zusammenstellen eines Inhaltssignals des Erfassungssignals, wobei das Inhaltssignal des Erfassungssignals mindestens ein Element der Gruppe umfasst, welche erfasste Schallinformationsdaten und einen Ballidentifikationscode umfasst.

4. Verfahren nach einem der vorhergehenden Ansprüche, wobei das Verfahren ferner umfasst:

- Erzeugen des Erfassungssignals in dem Ball; und
- drahtloses Übertragen des Erfassungssignals von dem Ball zu dem Signalisierungssystem.

5. Verfahren nach einem der vorhergehenden Ansprüche, wobei das wahrnehmbare Signal ein Signal umfasst, welches aus der Gruppe ausgewählt ist, welche ein hörbares Signal, ein optisches Signal und ein fühlbares Signal umfasst.

6. Verfahren nach Anspruch 5, wobei das wahrnehmbare Signal ein fühlbares Signal umfasst und der Schritt des Erzeugens des wahrnehmbaren Signals umfasst:

- Erzeugen einer Vibration in einem mit einem Körperteil des Schiedsrichters in Kontakt zu bringenden Objekt, wobei das Objekt zum Beispiel ein Fahngriff oder eine Handgelenksvorrichtung ist.

7. Verfahren nach einem der vorhergehenden Ansprüche, wobei der Kontakt mit dem Ball durch den ersten Spieler ein Treten des Balls ist.

8. System zum Erfassen eines Kontakts mit einem Ball durch einen ersten Spieler bei Spielen und Sport, wobei das System umfasst:

- einen Erfassungssignalgenerator, welcher ein Schallerfassungsmittel (SM), insbesondere ein Mikrofon, zum Erfassen eines von dem Ball (Ba) erzeugten Schallsignals und ein Schallverarbeitungsmittel (PM) umfasst, welches mit dem Schallerfassungsmittel gekoppelt ist zum Verarbeiten eines von dem Schallerfassungsmittel empfangenen Schallsignals, um zu Bestimmen, ob es einen Kontakt mit dem Ball durch den ersten Spieler gibt, wobei die Verarbeitung ein Vergleichen des erfassten Signals mit einem vorbestimmten Signal aufweist, wobei das vorbestimmte Signal das Signal eines Kontakts mit dem Ball durch einen Spieler ist, wobei der Erfassungssignalgenerator ein Erfassungssignal erzeugt, wenn das Schallverarbeitungsmittel feststellt, dass der Ball von dem ersten Spieler kontaktiert wird;
- ein Erfassungssignalübertragungssystem (TM) zum Zuführen des Erfassungssignals von dem Erfassungssignalgenerator zu einem Signalisierungssystem;
- einen Generator für ein wahrnehmbares Signal, welcher in dem Signalisierungssystem enthalten ist, zum Erzeugen eines von einem Schiedsrichter wahrzunehmenden wahrnehmbaren Signals in Erwiderung auf einen Empfang des Erfassungssignals.

9. System nach Anspruch 8, wobei der Erfassungssignalgenerator in den Ball angeordnet ist.
10. System nach einem der Ansprüche 8 bis 9, wobei das Erfassungssignalübertragungssystem ein drahtloses Übertragungssystem ist, welches insbesondere bei einer Frequenz arbeitet, die für ein Übertragen über eine Distanz von zumindest der Distanz einer Diagonalen des Spielfeldes geeignet ist.
11. System nach einem der Ansprüche 8 bis 10, wobei das Signalisierungssystem eine Fahne (F1) umfasst, wobei der Generator für das wahrnehmbare Signal in einem Teil der Fahne, insbesondere in einem Fahngriff, angeordnet ist.
12. System nach Anspruch 11, wobei das Signalisierungssystem als Generator für das wahrnehmbare Signal einen Generator für ein hörbares Signal, einen Generator für ein optisches Signal und/oder einen Generator für ein fühlbares Signal umfasst.
13. System nach einem der Ansprüche 8 bis 12, wobei das Signalisierungssystem in einem Fahngriff (FH) enthalten ist, wobei der Fahngriff einen Ballauswahlschalter (BS) umfasst, um einen Ball auf der Grundlage seines eigenen Ballidentifikationscodes, welcher in dem Erfassungssignal enthalten ist, auszuwählen.
14. System nach Anspruch 13, wobei der Fahngriff (FH) ferner einen Speicherleser (MR) zum Lesen eines Speichers, welcher einen oder mehrere Identifikationscodes einer Anzahl von entsprechenden Bällen speichert, umfasst, wobei der Identifikationscode des Balls, welcher in einem Spiel zu verwenden ist, von dem Speicher in Kombination mit dem Ballauswahlschalter ausgewählt werden kann.
15. System nach einem der Ansprüche 8 bis 14, wobei der Kontakt mit dem Ball durch den ersten Spieler ein Treten des Balls ist.

Revendications

1. Procédé pour détecter un contact avec une balle par un premier joueur dans des jeux et des sports, le procédé comprenant :
- la détection d'un signal sonore produit par la balle (Ba) ;
 - le traitement du signal sonore afin de déterminer s'il y a un contact avec la balle par le premier joueur, où le traitement comprend la comparaison du signal détecté à un signal prédéterminé, le signal prédéterminé étant le signal d'un contact avec la balle par un joueur ;

- si le traitement détermine que la balle est en contact avec le premier joueur, la génération d'un signal de détection ;
- la transmission du signal de détection à un système de signalisation ; et
- la génération par le système de signalisation d'un signal observable destiné à être observé par un arbitre, en réponse à la réception du signal de détection.

2. Procédé selon la revendication 1, dans lequel le procédé comprend en outre :

- la détection d'une position d'un deuxième joueur par l'arbitre au moment de l'observation du signal observable.

3. Procédé selon l'une quelconque des revendications précédentes, dans lequel la génération d'un signal de détection comprend :

- la compilation d'un signal de contenu du signal de détection, le signal de contenu du signal de détection comprenant au moins un élément du groupe comprenant des données d'informations sonores détectées et un code d'identification de balle.

4. Procédé selon l'une quelconque des revendications précédentes, dans lequel le procédé comprend en outre :

- la génération du signal de détection dans la balle ;
- et
- la transmission sans fil du signal de détection de la balle au système de signalisation.

5. Procédé selon l'une quelconque des revendications précédentes, dans lequel le signal observable comprend un signal choisi dans le groupe comprenant un signal audible, un signal visuel, et un signal tangible.

6. Procédé selon la revendication 5, dans lequel le signal observable comprend un signal tangible, et l'étape consistant à générer un signal observable comprend :

- la génération d'une vibration dans un objet destiné à être en contact avec une partie du corps de l'arbitre, l'objet étant, par exemple, une poignée de drapeau ou un dispositif de poignet.

7. Procédé selon l'une quelconque des revendications précédentes, dans lequel le contact avec la balle du premier joueur est une frappe de la balle.

8. Système pour détecter un contact avec une balle par un premier joueur dans des jeux et des sports, le système comprenant :

- un générateur de signal de détection comprenant un moyen de détection de son (SM), en particulier un microphone, pour détecter un signal sonore produit par la balle (Ba), et un moyen de traitement de son (PM) couplé au moyen de détection de son pour traiter un signal sonore reçu depuis le moyen de détection de son afin de déterminer s'il y a un contact avec la balle du premier joueur, où le traitement comprend la comparaison du signal détecté avec un signal prédéterminé, ledit signal prédéterminé est le signal d'un contact avec la balle d'un joueur, le générateur de signal de détection générant un signal de détection si le moyen de traitement de son détermine que la balle est en contact avec le premier joueur ;

- un système de transmission de signal de détection (TM) pour transmettre le signal de détection du générateur de signal de détection à un système de signalisation ;

- un générateur de signal observable compris dans le système de signalisation pour générer, en réponse à la réception du signal de détection, un signal observable destiné à être observé par un arbitre.

9. Système selon la revendication 8, dans lequel le générateur de signal de détection est agencé dans la balle.

10. Système selon l'une quelconque des revendications 8 à 9, dans lequel le système de transmission de signal de détection est un système de transmission sans fil, en particulier fonctionnant à une fréquence qui est adaptée pour transmettre sur une distance d'au moins la distance d'une diagonale d'un terrain de jeu.

11. Système selon l'une quelconque des revendications 8 à 10, dans lequel le système de signalisation comprend un drapeau (F1), le générateur de signal observable étant agencé dans une partie du drapeau, en particulier dans une poignée de drapeau.

12. Système selon la revendication 11, dans lequel le système de signalisation comprend en tant que générateur de signal observable au moins l'un parmi un générateur de signal audible, un générateur de signal visible et un générateur de signal tangible.

13. Système selon l'une quelconque des revendications 8 à 12, dans lequel le système de signalisation est compris dans une poignée de drapeau (FH), où la poignée de drapeau comprend un commutateur de

sélecteur de balle (BS) pour sélectionner une balle, sur la base de son propre code d'identification de balle, compris dans le signal de détection.

14. Système selon la revendication 13, dans lequel la poignée de drapeau (FH) comprend en outre un lecteur de mémoire (MR) pour lire une mémoire stockant un ou plusieurs codes d'identification d'une pluralité de balles correspondantes, dans lequel le code d'identification de la balle à utiliser dans un match peut être choisi dans la mémoire en combinaison avec le commutateur de sélecteur de balle.

15. Système selon l'une quelconque des revendications 8 à 14, dans lequel le contact avec la balle du premier joueur est une frappe de la balle.

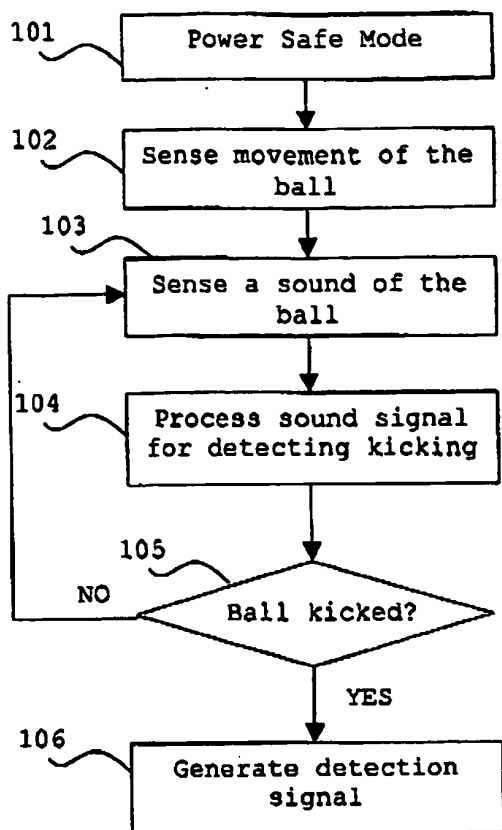


FIG. 1A

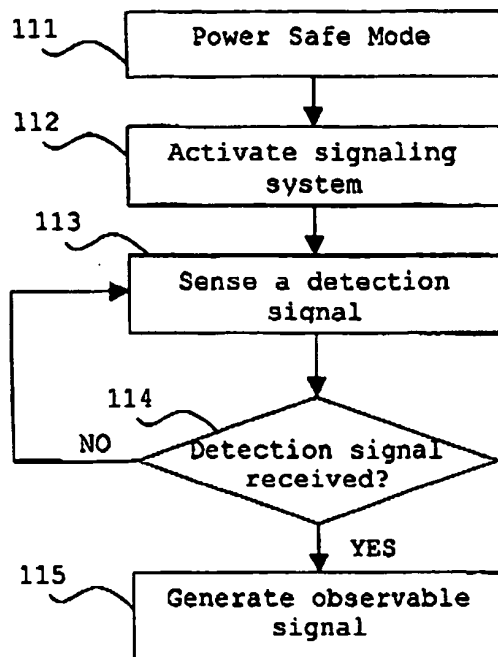


FIG. 1B

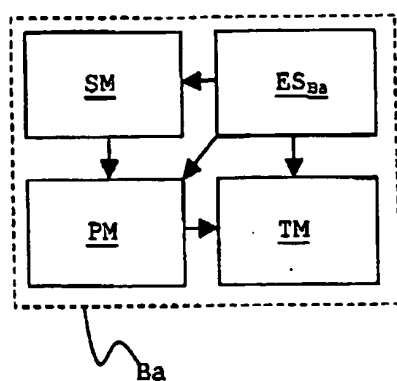


FIG. 2A

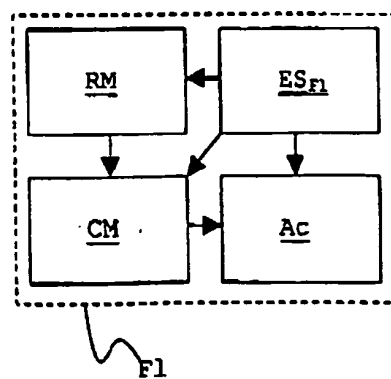


FIG. 2B

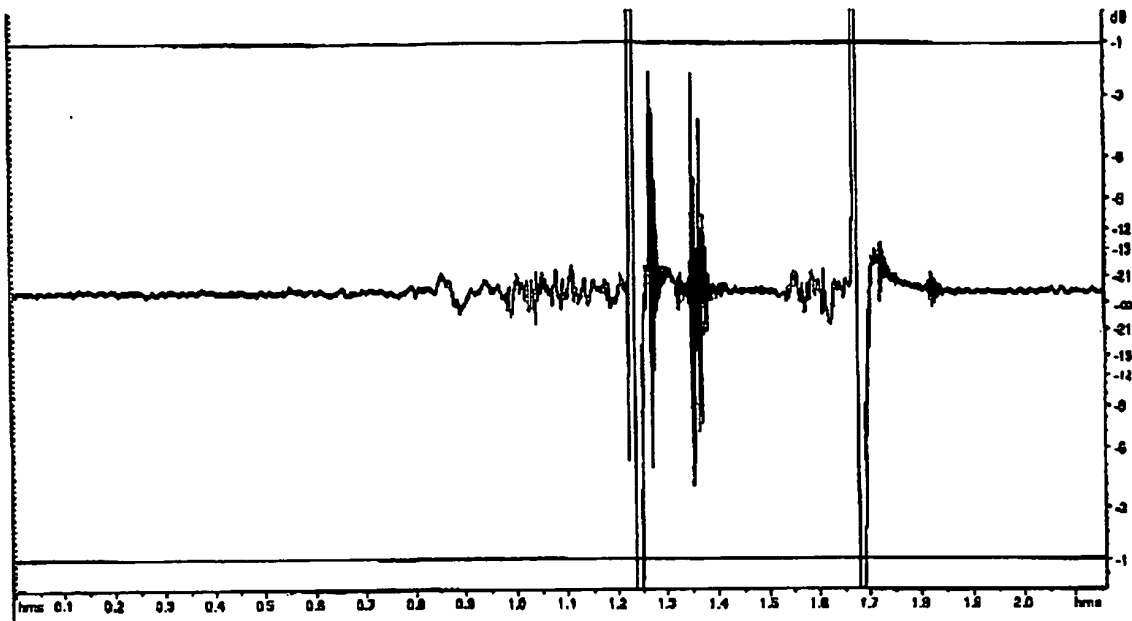


FIG. 3

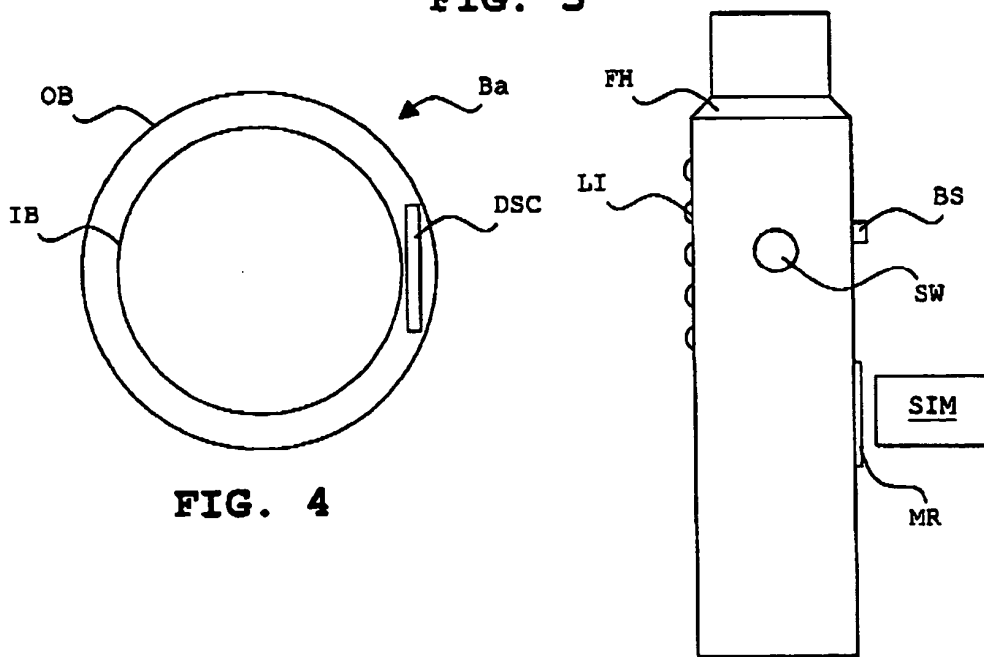


FIG. 4

FIG. 5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 9720449 A [0001]
- BE 1015552 [0004]