DESCRIPTION

START INDICATION LIGHT SYSTEM

Technical Field

The present invention relates to a start indication light system employed in speed races such as, for example, automobile races.

Background Art

The speed of start actions of race participants in speed races has been a crucial factor that decides who wins and who loses. Race participants compete against each other in terms of their characteristic quick reflexes, and race spectators intently watch the moment of start with breathless interest, so that they will not miss the moment.

Incidentally, technology for electronically measuring the reaction time of each race participant to a start sign in such a speed race so that a judge can detect a false start or so that a race participant can practice his or her start technique has been disclosed (for example, Japanese Unexamined Patent Application Publication (Translation of PCT Application) No. 2001-526919 and Japanese Unexamined Patent Application Publication No. 2007-117133).

Meanwhile, some spectators of a speed race potentially

desire not only to watch the race but also to compare their competitive abilities with the competitive abilities of race participants (race competitors). In the start scene of, for example, an automobile race, where racing cars waiting on a track start moving at the same time in response to illumination of a start sign light, in a case where a spectator can compete against drivers participating in the race in terms of the speed of reaction, which is time elapsed from showing of the start sign to an operation of a clutch lever for initiating a moving operation, under the same conditions, the enjoyment of the spectator can be increased. However, such an opportunity has not been provided.

The present invention has been designed in view of the above-described problem, and an object of the present invention is to provide a start indication light system that is capable of satisfying a potential desire of a race spectator to compete against race competitors in terms of the speed of reflexes in a speed race.

Disclosure of Invention

A start indication light system according to the present invention allows a race spectator to compete against race competitors in terms of the speed of reflexes by providing a device for visualizing a time required for a race competitor to perform a start action in response to a

start sign. Specifically, the start indication light system includes race start indication lights that distinctively indicate whether or not a speed race has been started; and competitor start indication lights that distinctively indicate, in association with start actions of corresponding race competitors in the speed race, states before the corresponding race competitors perform the start actions or states after the corresponding race competitors perform the start actions.

In the start indication light system according to the present invention, while the race start indication lights distinctively indicate whether or not the speed race has been started, the competitor start indication lights distinctively indicate, in association with start actions of corresponding race competitors in the speed race, states before the corresponding race competitors perform the start actions or states after the corresponding race competitors perform the start actions. Thus, in a case where a spectator of the speed race (a race spectator) takes a picture of the race start indication lights and the competitor start indication lights in response to a sign indicating the start of the race, the reaction speed of the race spectator and the reaction speeds of the race competitors to the sign indicating the start of the race can be compared with each other on the basis of states indicated

by the race start indication lights and the competitor start indication lights in the taken picture.

For example, in a case where the state before the race starts is indicated by the race start indication lights in the taken picture, it is determined that the reaction of the race spectator is a false start made before the start sign and is a foul. Meanwhile, in a case where the state after the race starts is indicated by the race start indication lights in the taken picture, when the state after a race competitor performs a start action is indicated by a competitor start indication light, it is determined that the reaction of the race competitor is faster than the reaction of the race spectator. In addition, in a case where the state after the race starts is indicated by the race start indication lights in the taken picture, when the state before a race competitor performs a start action is indicated by a competitor start indication light, it is determined that the reaction of the race spectator is faster than the reaction of the race competitor. Note that the reaction speed of a race spectator is ranked in a position between a race competitor for which the state after performance of a start action is indicated by a competitor start indication light and a race competitor for which the state before performance of a start action is indicated by a competitor start indication light in a taken picture.

Preferably, in the start indication light system according to the present invention, the race start indication lights have a function of also indicating an elapsed time from the start of the speed race. In the case of such a configuration, the reaction speed of the race spectator can be recognized not only by relative indication with respect to the race competitors but also by absolute indication (reaction time). In addition, in this case, preferably, the race start indication lights indicate the elapsed time from the start of the speed race at unequal intervals of time, while taking into consideration statistical reaction-time distribution of the race competitors in the speed race. In the case of such a configuration, adjustment can be performed so that the elapsed time from the start of the race can be indicated in such a manner that intervals of time where the frequency of distribution is high are short, while taking into consideration the statistical reaction-time distribution of the race competitors. Thus, the reaction time of the race spectator and the reaction time of each of the race competitors can be recognized with higher accuracy.

In the start indication light system according to the present invention, at least one of the race start indication lights, the competitor start indication lights, and start sign lights that indicate a sign of the start of the speed

race may also serve as advertising lights for a specific client and indicate a trademark, a product's name, or a company's name. In the case of such a configuration, the race spectator pays close attention to the indication lights as advertising lights twice, the time when they take a picture of the race start indication lights and the competitor start indication lights and the time when they observe the taken picture. Thus, compared with conventional normal advertising lights, high advertising effect can be achieved.

In the start indication light system according to the present invention, the race start indication lights may indicate a change from the state before the speed race starts to the state after the speed race starts in synchronization with the sign indicated by the start sign lights that indicate the sign of the start of the speed race or a sign sound generated by a start sign sound generation device that generates a sign sound indicating the start of the speed race.

In the start indication light system according to the present invention, a video camera device that generates a relayed picture of the speed race in such a manner that the contents of indication of the race start indication lights and the competitor start indication lights are displayed on the same screen of a display device may be provided, and the

start sign lights that indicate the sign of the start of the speed race or a start sign sound generation device that generates a sign sound indicating the start of the speed race may perform a start sign operation in synchronization with a frame signal of the relayed picture of the speed race. In the case of such a configuration, unfairness where a race spectator who watches the contents of indication based on the relayed picture on a display device recognizes the start sign operation later than the race competitors and spectators in the stadium can be avoided. In addition, since it is difficult to predict the timing of the start sign operation, the effect of avoidance of guessed start by the race competitors and the race spectators can also be expected.

In this case, the relayed picture of the speed race may be supplied to the display device by using television broadcasting, Internet video streaming, movies, or video games.

In the start indication light system according to the present invention, the speed race may be, for example, an automobile race, a skate race, a ski race, a track and field athletics race, or a swimming race. In addition, in a case where the speed race is an automobile race, the competitor start indication lights may be installed on racing cars in which the race competitors in the speed race sit. Note that

as such racing cars, for example, automobiles, autobicycles, karts, snowmobiles, or remote control model cars may be used.

According to a start indication light system according to the present invention, race start indication lights that distinctively indicate whether or not a speed race has been started and competitor start indication lights that distinctively indicate, in association with start actions of corresponding race competitors in the speed race, states before the corresponding race competitors perform the start actions or states after the corresponding race competitors perform the start actions are provided. Thus, in a case where a race spectator takes a picture of the race start indication lights and the competitor start indication lights in response to a sign indicating the start of the race, the reaction speed of the race spectator and the reaction speeds of the race competitors to the sign indicating the start of the race can be compared in the taken picture. Therefore, a potential desire of a race spectator to compete against race competitors in terms of the speed of reflexes in a speed race can be satisfied.

Brief Description of Drawings

Fig. 1 is a block diagram showing an example of a scene where a start indication light system according to an embodiment of the present invention is employed.

Fig. 2 is a plan view showing an example of the detailed configuration of a start indication lamp shown in Fig. 1.

Fig. 3 is a block diagram showing an example of the detailed configuration of an operator room shown in Fig. 1.

Fig. 4 is a timing chart showing an example of operations of the start indication light system according to the embodiment.

Figs. 5A to 5F are plan views showing an example of operations of start sign lights at the time of start.

Fig. 6 is a timing chart showing an example of a function of providing relayed pictures, where a start sign is not delayed, to a viewer of on-the-spot broadcast.

Figs. 7A to 7F are plan views showing an example of operations of race start indication lights after the start.

Fig. 8 is an illustration showing an example of indication by the race start indication lights in which intervals of time are unequal.

Figs. 9A to 9D are schematic diagrams showing examples of pictures of the start indication lamp taken by individual race spectators.

Fig. 10 is an illustration showing an example of results of competition in terms of the speed of reflexes by individual race competitors and individual race spectators.

Fig. 11 is a plan view showing the detailed

configuration of a start indication lamp according to a modification of the present invention.

Fig. 12 is a plan view showing the detailed configuration of a start indication lamp according to another modification of the present invention.

Figs. 13A to 13D are plan views showing detailed configurations of a start indication lamp according to another modification of the present invention.

Fig. 14 is a plan view showing the detailed configuration of a start indication lamp according to another modification of the present invention.

Fig. 15 is a perspective view showing the detailed configuration of a start indication lamp and racing cars according to another modification of the present invention.

Fig. 16 is a perspective view in which a racing car shown in Fig. 15 is enlarged and shown.

Fig. 17 is a plan view showing an example of an application scene in a case where the contents of the start indication lamp and the competitor start indication lights shown in Fig. 15 are displayed on the same screen of a display device.

Best Modes for Carrying Out the Invention

Hereinafter, embodiments of the present invention will be described in detail.

Fig. 1 shows an example of a scene where a start indication light system (a start indication light system 1) according to an embodiment of the present invention is employed. The start indication light system 1 is applied to a game (VEATLS (Virtual Entrants AT Live Sports) game), where the reaction speeds of race spectators 27D to 27F and 37C and the reaction speeds of race competitors (here, race competitors who sit in racing cars 21A and 21B) to a sign indicating the start of a speed race (here, an automobile race in which the two racing cars 21A and 21B compete against each other) are compared with each other. An example of a configuration to which the start indication light system 1 is applied is constituted by a stadium 2 and a house 3.

In the stadium 2, the two racing cars 21A and 21B located on a race track 20, two pairs of photoelectric tube sensors 22A1 and 22A2; and 22B1 and 22B2, a start indication lamp 23, an operator room 24, an on-the-spot relay video camera 25, and an outdoor monitor 26 are arranged.

The race track 20 is a track where the racing cars 21A and 21B actually run in an automobile race.

Race competitors in the automobile race sit in the racing cars 21A and 21B. The racing cars 21A and 21B are arranged on the race track 20 and are waiting for a start sign. The photoelectric tube sensors 22A1 and 22A2 and the

photoelectric tube sensors 22B1 and 22B2 detect start actions of the racing cars 21A and 21B, respectively. For example, the photoelectric tube sensors 22A1 and 22B1 are each constituted by a light-emitting device, and the photoelectric tube sensors 22A2 and 22B2 are each constituted by a light-receiving device. In addition, the photoelectric tube sensors 22A2 and 22B2 functioning as light-receiving devices are configured to transmit control signals S12A and S12B, which represent detection results of start actions of the racing cars 21A and 21B, to competitor start indication lights 232A and 232B within the start indication lamp 23, which will be described later.

As means replacing the photoelectric tube sensors for detecting start actions of race competitors, sensors (not illustrated) for detecting operations of accelerator pedals or clutch levers for initiating moving operations of the racing cars 21A and 21B and control units (not illustrated) for controlling the contents of indication of competitor start indication lights 232 within the start indication lamp 23 on the basis of detection results of the sensors may be included. In addition, in the case of a track and field athletics race, a swimming race, and the like, instead of the above-mentioned sensor, a pressure sensor for detecting the force of a race competitor's foot kicking footplates (a start block) may be provided.

The start indication lamp 23 indicates a sign of the start of a speed race (here, an automobile race), distinctively indicates whether or not the speed race has been started, and distinctively indicates the state before a race competitor performs a start action or the state after the race competitor performs the start action. Note that an example of the detailed configuration of the start indication lamp 23 will be described later.

The operator room 24 is configured to control illuminating and extinguishing operations of each indication light within the start indication lamp 23 by transmitting a control signal S11 from this room to the start indication lamp 23. Note that the detailed configuration of the operator room 24 will be described later.

The on-the-spot relay video camera 25 is configured to generate relayed pictures D1 of a speed race (here, an automobile race) in such a manner that the contents of indication of the start indication lamp 23 are displayed on the same screen within a display device such as the outdoor monitor 26 or an indoor television set 36, which will be described later, and to supply the relayed pictures D1 to the outdoor monitor 26, the indoor television set 36, and the like via wired or wireless communications. The relayed pictures D1 are supplied to the display devices by using, for example, television broadcasting, Internet video

streaming, movies, or video games. In addition, the frame rate of moving images of the relayed pictures D1 is, for example, 60 frames per second (60 FPS), as described later. Note that a frame synchronization signal S2 of the relayed pictures D1 is supplied into the operator room 24, as described later in detail.

The outdoor monitor 26 is a large screen installed inside or outside the stadium 2 (here, inside the stadium 2). The relayed pictures D1 are supplied from the on-the-spot relay video camera 25 to the outdoor monitor 26, and the contents of indication of the start indication lamp 23 are thus displayed on the same screen. In addition, since the outdoor monitor 26 is directly linked to the on-the-spot relay video camera 25 without propagation of television broadcasting waves under the constraint of 30 FPS (frames/second), the outdoor monitor 26 is capable of high-speed reproduction of moving images at 60 FPS, as stated above, or more than 100 FPS.

The spectators 27D, 27E, and 27F of the race (spectators in the stadium) are spectators who are each able to feel a game of comparison of speeds of reaction, which will be described later in detail, by taking a picture of the start indication lamp 23 or the contents of indication of the start indication lamp 23 displayed on the outdoor monitor 26 by using an image capturing device such as a

camera, as shown by arrows P2 to P4 in the figure. Note that the spectators 27D and 27E are spectators who directly take a picture of the start indication lamp 23, and the spectator 27F is a spectator who takes a picture of the contents of indication of the start indication lamp 23 indicated on the outdoor monitor 26.

The indoor television set 36 is installed in the house 3.

The relayed pictures D1 are supplied from the on-the-spot relay video camera 25 to the indoor television set 36, and the contents of indication of the start indication lamp 23 are displayed on the same screen. Note that the indoor television set 36 does not necessarily display moving images for television broadcasting. The indoor television set 36 may also be capable of displaying DVD (Digital Versatile Disc) pictures, pictures based on a video game, Internet video streaming, movies, and the like.

The spectator 37C of the race (a viewer of on-the-spot relay broadcast) is a spectator who is able to feel a game of comparison of speeds of reaction, which will be described later in detail, by taking a picture of the contents of indication of the start indication lamp 23 displayed on the indoor television set 36 by using an image capturing device such as a camera, as shown by an arrow P1 in the figure.

An example of the detailed configuration of the start

indication lamp 23 will now be described with reference to Fig. 2. The start indication lamp 23 has a configuration in which start sign lights 230, race start indication lights 231, and the competitor start indication lights 232 are provided in a single indication unit.

The start sign lights 230 indicate a sign of the start of a speed race (here, an automobile race). The start sign lights 230 are constituted by a plurality of (here, five) indication lights arranged in a line along a specific direction (here, a horizontal direction). Illuminating and extinguishing operations of the start sign lights 230 are controlled in accordance with the control signal S11 supplied from the operator room 24. As described later in detail, the start sign lights 230 are configured to perform a start sign operation in synchronization with the frame signal S2 of the relayed pictures D1 supplied from the on-the-spot relay video camera 25 to the operator room 24.

The race start indication lights 231 distinctively indicate whether or not a speed race (here, an automobile race) has been started. The race start indication lights 231 are constituted by a plurality of (here, five) indication lights arranged in a line along a specific direction (here, a horizontal direction), and have a function of also indicating the elapsed time from the start of the speed race, in accordance with binary indication (in

this case, binary indication of $2^5 - 1 = 31$ patterns) based on whether or not the plurality of indication lights are illuminated. In addition, the race start indication lights 231 are configured to indicate a change from the state before the speed race starts to the state after the speed race starts in synchronization with the sign indicated by the start sign lights 230 (depending on the situation, a sign sound generated by a start sign sound generation device (not illustrated) for generating a sign sound indicating the start of a speed race). Here, as described later in detail, it is desirable that the elapsed time from the start of such a speed race be indicated at unequal intervals of time, while taking into consideration the statistical reaction-time distribution of race competitors in the speed race. Note that illuminating and extinguishing operations of the race start indication lights 231 are also controlled in accordance with the control signal S11 supplied from the operator room 24.

The competitor start indication lights 232 distinctively indicate, in association with start actions of race competitors in a speed race (here, an automobile race), states before the race competitors perform the start actions of the racing cars 21A and 21B or states after the race competitors perform the start actions of the racing cars 21A and 21B. The competitor start indication lights 232 are

constituted by the competitor start indication light 232A corresponding to the racing car 21A and the competitor start indication light 232B corresponding to the racing car 21B. Illuminating and extinguishing operations of the competitor start indication lights 232 that are associated with the start actions are controlled in accordance with the control signals S12A and S12B transmitted from the photoelectric tube sensors 22A2 and 22B2 or control signals transmitted from sensors for detecting operations of clutch levers for initiating moving operations installed in the racing cars 21A and 21B.

Note that it is desirable that the indication lights of the start sign lights 230, the race start indication lights 231, and the competitor start indication lights 232 be each constituted by illumination equipment whose response time from turning on of a power switch to illumination is, for example, 0.01 seconds or less. This is because of the reason described below. That is, for example, in a case where incandescent lights are used for the indication lights, a response time required from turning on of a power switch to illumination is within a range from about 0.2 seconds to about 0.25 seconds. Meanwhile, the reaction time required for each of top-ranked competitors participating in an automobile race in this embodiment to operate a clutch lever for initiating a moving operation in response to the start

sign lights 230 generally falls within a range from about 0.2 seconds to about 0.3 seconds. Thus, in a case where incandescent lights are used for indication lights, about twice the actual time is required for illumination indication for reactions of race competitors to a start sign. In this situation, as described later, in a case where a spectator competes against a race competitor in terms of reflexes, the race competitor suffers such a disadvantage. Therefore, a problem in terms of the fairness in the race occurs.

An example of the detailed configuration of the operator room 24 will now be described with reference to Fig. 3. A control unit 240, a start preparation switch 241, a start switch 242, and an abort switch 243 are installed in the operator room 24.

The control unit 240 is constituted by a timer 240B; and a controller 240A for generating and outputting the control signal S11 on the basis of the frame synchronization signal S2, control signals from the start preparation switch 241, the start switch 242, and the abort switch 243, and time information from the timer 240B.

The start preparation switch 241 is, as described later in detail, a switch for controlling illuminating operations of indication lights (indication lights 230-1 to 230-5 described later) of the start sign lights 230.

The start switch 242 is, as described later in detail, a switch for controlling a timing at which all the indication lights of the start sign lights 230 simultaneously perform extinguishing operations (the moment of a start sign) after all the indication lights of the start sign lights 230 are illuminated.

The abort switch 243 is a switch for canceling the start sign indicated by the start sign lights 230 in a case where, for example, trouble has occurred in a race competitor, the racing car 21A, or the racing car 21B before start.

Operations of the start indication light system 1 according to this embodiment will now be described with reference to Figs. 4 to 10. Fig. 4 shows operations of the start indication light system 1 by way of a timing chart. Fig. 4(A) shows a race proceeding process, Fig. 4(B) shows an operation of the on-the-spot relay video camera 25, Fig. 4(C) shows an operation of a starter (not illustrated), Fig. 4(D) shows an operation of a start sign control panel (not illustrated), Fig. 4(E) shows an operation of the start sign lights 230, Fig. 4(F) shows an operation of the race start indication lights 231, and Fig. 4(G) shows an operation of the racing car 21A. Fig. 4(H) shows an operation of the competitor start indication light 232A for the racing car 21A, Fig. 4(I) shows an operation of the racing car 21B, Fig.

4(J) shows an operation of the competitor start indication light 232B for the racing car 21B, Fig. 4(K) shows an operation of the spectator 37C (the viewer of on-the-spot relay broadcast), Fig. 4(L) shows an operation of the spectator 27D (the spectator in the stadium), Fig. 4(M) shows an operation of the spectator 27E (the spectator in the stadium), and Fig. 4(N) shows an operation of the spectator 27F (the spectator in the stadium).

First, as shown in Fig. 4(A), before the start in the race proceeding process, the race start indication lights 231 shown in Fig. 4(F) are in an extinguished state.

Meanwhile, before the start in the race proceeding process, for example, as shown in Figs. 5A to 5F in order, in the start sign lights 230, a plurality of (here, five) indication lights 230-1 to 230-5 are sequentially illuminated at specific intervals in accordance with control signals by the start preparation switch 241 (see Fig. 4(D) and Fig. 4(E)). In addition, after all the five indication lights 230-1 to 230-5 are illuminated, after an indeterminate period of time based on a control signal by the start switch 242 and the frame signal S2 of the relayed pictures D1 has passed, all the indication lights 230-1 to 230-5 are simultaneously extinguished (see Fig. 4(D) and Fig. 4(E)).

Specifically, for example, as shown in Figs. 6(A) to

6(D) in a timing chart, after the start switch 242 is pressed (a start pulse is generated) and a control signal (start enable signal) based on the depression of the start switch 242 reaches "H (high)", the indication lights 230-1 to 230-5 are simultaneously extinguished in synchronization with the frame signal S2 of the relayed pictures D1 (at timing t2, which is a timing after time α has passed since timing t1 in the figure), and the race is started. Thus, unfairness where the spectator 37C (the viewer of on-the-spot relay broadcast) who watches the contents of indication based on the relayed pictures D1 on the indoor television set 36 recognizes the start sign operation later than the race competitors and the spectators 27D to 27E (the spectators in the stadium) in the stadium can be avoided. Meanwhile, in a case where the start sign is out of synchronization with the frame signal S2, since a delay corresponding to the time α shown in Fig. 6 occurs in the relayed pictures D1, the spectator 37C (the viewer of on-the-spot relay broadcast) who watches the start sign on the indoor television set 36 recognizes the start sign operation later than the race competitors and the spectators 27D to 27E (the spectators in the stadium) in the stadium. In addition, since the start sign is in synchronization with the frame signal S2, it is difficult to predict the timing of the simultaneous extinguishing operations (start sign

operation) of the indication lights 230-1 to 230-5 of the start sign lights 230. Thus, the effect of avoidance of guessed start by the race competitors and the race spectators can also be expected.

Then, after the start in the race proceeding process, as stated above, for example, all the indication lights 230-1 to 230-5 of the start sign lights 230 are in the extinguished state (Fig. 4(E) and Fig. 5F).

Meanwhile, after the start in the race proceeding process, for example, as shown in Fig. 4(F) and Figs. 7A to 7F in order, in the race start indication lights 231, the elapsed time from the start of the speed race (here, an automobile race) is indicated in accordance with binary indication ($2^5 - 1 = 31$ patterns: here, the indication light 231-1-side represents a lower digit) based on whether or not a plurality of (here, five) indication lights 231-1 to 231-5 are illuminated.

In addition, here, for example, as individually shown by frame numbers "1" to "31" and symbols "(X)", "(Y)", "(Z)", "(V)", and "(W)" in Fig. 8, the elapsed time from the start of such a speed race is indicated at unequal intervals of time, while taking into consideration the statistical reaction-time distribution of the race competitors in the speed race. Specifically, adjustment is performed so that the elapsed time from the start of the race can be indicated

in such a manner that intervals of time where the frequency of distribution is high are short and intervals of time where the frequency of distribution is low are long, while taking into consideration the statistical reaction-time distribution of the race competitors. Thus, the reaction time of each of the race spectators and the reaction time of each of the race competitors can be recognized with higher accuracy.

In addition, after the start in the race proceeding process, for example, as shown in Figs. 4(G) and 4(I), when start actions of the racing cars 21A and 21B by the race competitors are performed and the racing cars 21A and 21B start running, the competitor start indication lights 232A and 232B are sequentially illuminated on the basis of the control signals S12A and S12B, in association with the start actions of the corresponding racing cars 21A and 21, for example, as shown in Figs. 4(H) and 4(J).

Here, under such conditions, for example, as shown in Figs. 4(K) to 4(N), when the spectators 37C and 27D to 27F take pictures of the start indication lamp 23 (specifically, the race start indication lights 231 and the competitor start indication lights 232A and 232B) in response to the sign of the start sign lights 230, taken pictures (pictures 41C to 41F) are obtained, for example, as shown in Figs. 9A to 9D, in accordance with the reaction time of each of the

spectators 37C and 27D to 27F and the reaction time of each of the race competitors in the corresponding racing cars 21A and 21B. Note that the pictures 41C to 41F shown in Figs. 9A to 9D represent examples of pictures taken by the spectator 37C, the spectator 27D, the spectator 27E, and the spectator 27F, respectively.

In the start indication light system 1 according to this embodiment, while the race start indication lights 231 distinctively indicate whether or not a speed race (here, an automobile race) has been started, the competitor start indication lights 232A and 232B distinctively indicate, in association with start actions of corresponding race competitors in the speed race, states before the corresponding race competitors perform the start actions or states after the corresponding race competitors perform the start actions. Thus, in a case where spectators (race spectators) of the speed race take pictures of the race start indication lights 231 and the competitor start indication lights 232A and 232B in response to the sign indicating the start of the race as described above, reaction speeds of the spectators 37C and 27D to 27F and reaction speeds of the race competitors in the corresponding racing cars 21A and 21B to the sign indicating the start of the race can be relatively compared with each other on the basis of illuminated or extinguished states indicated by the

race start indication lights 231 and the competitor start indication lights 232A and 232B in the taken pictures (for example, the pictures 41C to 41F).

Specifically, for example, in a case where the state before the race starts is indicated by the race start indication lights 231 in the pictures 41C to 41F, it is determined that reactions of the spectators 37C and 27D to 27F are false starts and are fouls (here, the reaction of the spectator 37C corresponding to the picture 41C falls into this case).

Meanwhile, in a case where the state after the race starts is indicated by the race start indication lights 231 in the pictures 41C to 41F, when the state after a race competitor performs a start action is indicated by the competitor start indication light 232A or 232B, it is determined that the reaction of the race competitor is faster than the reactions of the spectators 37C and 27D to 27F (here, the reactions of the spectators 27E and 27F corresponding to the pictures 41E and 41F fall into this case (in the case of the picture 41E, it is determined that the reaction of the race competitor in the racing car 21A is faster than the reaction of the spectator 27E)).

In addition, in a case where the state after the race starts is indicated by the race start indication lights 231 in the pictures 41C to 41F, when the state before a race

competitor performs a start action is indicated by the competitor start indication light 232A or 232B, it is determined that reactions of the spectators 37C and 27D to 27F are faster than the reaction of the race competitor (here, the reactions of the spectators 27D and 27E corresponding to the pictures 41D and 41E fall into this case (in the case of the picture 41E, it is determined that the reaction of the spectator 27E is faster than the reaction of the race competitor in the racing car 21B)).

Furthermore, for example, as shown in Fig. 10, the reaction speeds of the spectators 37C and 27D to 27F are ranked in positions between a race competitor for which the state after performance of a start action is indicated by the competitor start indication light 232A or 232B and a race competitor for which the state before performance of a start action is indicated by the competitor start indication light 232A or 232B in the pictures 41C to 41F.

As described above, in this embodiment, the race start indication lights 231 that distinctively indicate whether or not a speed race (here, an automobile race) has been started and the competitor start indication lights 232A and 232B that distinctively indicate, in association with start actions of corresponding race competitors in the speed race (here, corresponding race competitors in the racing cars 21A and 21B), states before the corresponding race competitors

perform the start actions or states after the corresponding race competitors perform the start actions are provided. Thus, in a case where the spectators 37C and 27D to 27F of the speed race take pictures of the race start indication lights 231 and the competitor start indication lights 232A and 232B in response to the sign indicating the start of the race by the start sign lights 230, the reaction speeds of the spectators 37C and 27D to 27F and the reaction speeds of the race competitors in the corresponding racing cars 21A and 21B to the sign indicating the start of the race can be relatively compared with each other on the basis of illuminated or extinguished states indicated by the race start indication lights 231 and the competitor start indication lights 232A and 232B in the taken pictures (for example, the pictures 41C to 41F). Therefore, a potential desire of a race spectator to compete against race competitors in terms of the speed of reflexes in a speed race can be satisfied.

In addition, since the race start indication lights 231 are configured to have a function of also indicating the elapsed time from the start of the speed race, the reaction speeds of the spectators 37C and 27D to 27F can be recognized not only by relative indication with respect to the race competitors in the corresponding racing cars 21A and 21B but also by absolute indication (reaction time).

In addition, adjustment can be performed so that the race start indication lights 231 indicate the elapsed time from the start of the race in such a manner that intervals of time where the frequency of distribution is high are short, while taking into consideration the statistical reaction-time distribution of the race competitors. Thus, the reaction time of each of the spectators 37C and 27D to 27F and the reaction time of each of the race competitors in the corresponding racing cars 21A and 21B can be recognized with higher accuracy.

In addition, the on-the-spot relay video camera 25 that generates the relayed pictures D1 in such a manner that the contents of indication of the race start indication lights 231 and the competitor start indication lights 232A and 232B are displayed on the same screen of a display device, such as the outdoor monitor 26 or the indoor television set 36, is provided and the start sign lights 230 perform a start sign operation in association with the frame signal S2 of the relayed pictures D1. Thus, unfairness where the spectator 37C (the viewer of on-the-spot relay broadcast) who watches the contents of indication based on the relayed pictures D1 on the indoor television set 36 recognizes the start sign operation later than the race competitors and the spectators 27D to 27E (the spectators in the stadium) in the stadium can be avoided. In addition, since it is difficult

to predict the timing of the start sign operation, the effect of avoidance of guessed start by the race competitors in the corresponding racing cars 21A and 21B and the spectators 37C and 27D to 27F can also be expected.

In addition, since the above-mentioned on-the-spot relay video camera 25 is provided, the viewers who watch the race on the basis of the relayed pictures D1 (for example, the spectators 37C and 27F) are also able to relatively compare the reaction speeds of the spectators 37C and 27 and the reaction speeds of the race competitors in the corresponding racing cars 21A and 21B to the sign indicating the start of the race on the basis of the contents of indication of the race start indication lights 231 and the competitor start indication lights 232A and 232B displayed, on the basis of the relayed pictures D1, on the same screen of a display device, such as the outdoor monitor 26 or the indoor television set 36.

Furthermore, since the race start indication lights 231 and the competitor start indication lights 232A and 232B are each constituted by illumination equipment (for example, light-emitting diode illumination equipment) whose response time from turning on of a power switch to illumination is, for example, 0.01 seconds or less, the fairness among spectators and race competitors in the race can be improved.

Although the present invention has been described above

by way of an embodiment, the present invention is not limited to the above-described embodiment. Various changes can be made to the present invention.

For example, as shown by a start indication lamp 23A shown in Fig. 11, specific positioning marking portions 233A and 233B may be provided on ends along a specific direction (here, a horizontal direction) of a plurality of indication lights of the race start indication lights 231 or the like. In the case of such a configuration, for example, in a case where the elapsed time from the start of a race is automatically detected in accordance with binary indication by, for example, causing an optical code reader or the like to scan the pictures 41C to 41F taken by the spectators 37C and 27D to 27F, an upper digit and a lower digit of the binary indication can be easily detected. Thus, for example, data processing operations at the time of creating a list of total results, for example, as shown in Fig. 10, can be easily performed.

In addition, for example, as shown by a start indication lamp 23B shown in Fig. 12, at least one of indications and the like of the race start indication lights 231, the competitor start indication lights 232A and 232B, and the start sign lights 230 may also serve as advertising lights for a specific client and indicate a trademark, a product's name, or a company's name. In the case of such a

configuration, the spectators 37C and 27D to 27F pay close attention to the indication lights as advertising lights twice, the time when they take a picture of the race start indication lights 231 and the competitor start indication lights 232A and 232B and the time when they observe the taken picture (picture). Thus, compared with conventional normal advertising lights, high advertising effect can be achieved.

In addition, although a case where the start indication lamp 23 is constituted by the race start indication lights 231, the competitor start indication lights 232A and 232B, and the start sign lights 230 has been described in the above-described embodiment, for example, as shown by a start indication lamp 23D shown in Fig. 14, the start indication lamp 23D may be constituted only by the race start indication lights 231 and the competitor start indication lights 232A and 232B. This method is particularly suitable for cases of track and field athletics and swimming races, where a sign indicating the start of a race is provided by a sound such as a crack of a pistol shot.

In addition, for example, as shown by a start indication lamp 23C shown in Figs. 13A to 13D, race start indication lights 231C and competitor start indication lights 232C for, for example, eight race competitors A1 to A8 may be constituted by a plurality of indication lights

arranged in lines along a specific direction (here, a horizontal direction), and the elapsed time from the start of a speed race (here, an automobile race) and states before or after corresponding race competitors perform start actions may be indicated by dot-matrix indication based on whether or not the plurality of indication lights are illuminated. In the case of such a configuration, the elapsed time from the start of the race to the moments of performance of start actions by the corresponding race competitors A1 to A8 can be recognized.

In addition, although a case where the start indication lamp 23 is constituted by a single indication unit including the race start indication lights 231 and the competitor start indication lights 232 has been described in the above-described embodiment, for example, in a case where a speed race is an automobile race or the like, as shown by a start indication lamp 23E shown in Figs. 15 to 17, the start indication lamp 23E may include the race start indication lights 231 and the start sign lights 230, and competitor start indication lights 282 may be installed on individual racing cars 28 in which race competitors in the speed race sit (specifically, on a car main unit 280 of each of the racing cars 28). In addition, a headlight or a taillight (not illustrated) of each of the racing cars 28 may also serve as the competitor start indication light 282. As

described above, in a case where the competitor start indication lights 282 are provided on the racing cars 28, instead of being provided in the start signal lamp 23E installed on the race track 20, compared with the photoelectric tube sensors 22A2 and 22B2, accelerator pedals or sensors for detecting operations of clutch levers for initiating moving operations of the racing cars 28 are easy to install and thus suitable as means for detecting start actions of race competitors. Note that the start indication lamp 23E and the competitor start indication lights 282 on the individual racing cars 28 are arranged so as to fall within the same screen in each of pictures to be taken by the spectators 37C and 27D to 27F. In addition, in this case, for example, as shown by the indoor television set 36 (or the outdoor monitor 26) shown Fig. 17, each of the contents 362A of indication of the race start indication lights 231 and the contents 362B of indication of the competitor start indication lights 282 may be enlarged and displayed on the same screen of the display device (a picture display area 361 and an indication light display area 362). Note that displaying the enlarged contents 362A of indication of the race start indication lights 231 and the enlarged contents 362B of indication of the competitor start indication lights 282 as described above is unnecessary for movies or large-screen television but is

effective for a small display screen of a cellular phone terminal or the like in order to acquire a photographic resolution that is necessary for determining an illuminated or extinguished state.

In addition, although a case where the race start indication lights 231, the competitor start indication lights 232 or 282, and the start sign lights 230 indicate states based on illumination or extinction has been described in the above-described embodiment, the indication of such a state may be based on either a change from extinction to illumination or a change from illumination to extinction or based on a change of illumination color (for example, a change from red to blue).

In addition, although a case where the frame rate of the relayed pictures D1 is 60 FPS has been described in the above-described embodiment, the frame rate of the relayed pictures D1 is not limited to this. However, it is desirable that the frame rate of the relayed pictures D1 be, for example, 100 or more frames per second (100 or more FPS). This is because of the reason described below. That is, since the reaction time required for each of top-ranked competitors participating in an automobile race to operate a clutch lever for initiating a moving operation in response to the start sign lights 230 generally falls within a range from about 0.2 seconds to about 0.3 seconds as described

above, all the race competitors perform start actions within the difference, 0.1 seconds. Meanwhile, television broadcasting display based on the NTSC system handles moving images of 30 frames per second (30 FPS) and three screens are displayed during 0.1 seconds. For example, in a case where the number of race competitors who start at the same time in an automobile race is twelve, since illumination of the competitor start indication lights 232 for an average of four or more competitors is observed on a single screen, only evaluation using three grades can be achieved in the three screens as the precision of result determination. Thus, by displaying the relayed pictures D1 at a speed of 100 FPS or more as stated above, ten screens during 0.1 seconds, that is, evaluation using ten grades or more can be achieved as the precision of result determination.

In addition, although an automobile has been described as an example of a racing car used in an automobile race in the above-described embodiment, for example, an autobicycle, a kart, a snowmobile, a remote control model car, or the like may also be used as such a racing car.

In addition, although an automobile race has been described as an example of a speed race in the above-described embodiment, such a speed race may also be a skate race, a ski race, a track and field athletics race, a swimming race, or the like. In this case, in a speed race

where, instead of the start sign lights 230, a start sign sound generation device (not illustrated) for generating a sign sound indicating the start of the speed race is provided, for example, the race start indication lights 231 can indicate a change from the state before the speed race starts to the state after the speed race starts in synchronization with the sign sound generated by the start sign sound generation device.

In addition, the start indication light system according to the present invention is also applicable to, for example, pictures recorded on a DVD or pictures based on a game machine. Note that in the case of pictures based on a game machine, a viewer of on-the-spot relay broadcast may check illuminated or extinguished states of the race start indication lights 231 and the competitor start indication lights 232 in accordance with an image frame selected by pressing an operation button of the game machine, instead of taking a picture of the display screen.

Industrial Applicability

In a situation in which the sports world has taken steps toward commercialism, where business developments regarding selling of admission tickets, making of contracts for rights of television broadcasting, and installation of institutional advertising billboards have been advanced in

order to deal with soaring running costs, in accordance with increases in the scale of global events, such as the Olympics and the Formula One grand prix races, a start indication light system according to the present invention is capable of increasing the amount of sales of admission tickets and the rights of television broadcasting and obtaining new revenue from institutional advertising billboards by providing new entertainment such as a reflex game in which all the spectators in a stadium and viewers of on-the-spot relay broadcast can participate, without using a dedicated game machine controller, as long as they own a camera or a cellular phone terminal provided with a camera. Consequently, the start indication light system according to the present invention has an industrial applicability.

CLAIMS

1. A start indication light system characterized by comprising:

race start indication lights that distinctively indicate whether or not a speed race has been started; and

competitor start indication lights that distinctively indicate, in association with start actions of corresponding race competitors in the speed race, states before the corresponding race competitors perform the start actions or states after the corresponding race competitors perform the start actions.

2. The start indication light system according to Claim 1, characterized in that

the race start indication lights have a function of also indicating an elapsed time from the start of the speed race.

3. The start indication light system according to Claim 2, characterized in that

the race start indication lights indicate the elapsed time from the start of the speed race at unequal intervals of time, while taking into consideration statistical reaction-time distribution of the race competitors in the speed race.

4. The start indication light system according to any one

of Claims 1 to 3, characterized in that

at least one of the race start indication lights, the competitor start indication lights, and start sign lights that indicate a sign of the start of the speed race also serve as advertising lights for a specific client.

5. The start indication light system according to any one of Claims 1 to 4, characterized by further comprising:

a video camera device that generates a relayed picture of the speed race in such a manner that the contents of indication of the race start indication lights and the competitor start indication lights are displayed on the same screen of a display device,

wherein the start sign lights that indicate the sign of the start of the speed race or a start sign sound generation device that generates a sign sound indicating the start of the speed race performs a start sign operation in synchronization with a frame signal of the relayed picture of the speed race.

6. The start indication light system according to any one of Claims 1 to 5, characterized in that

the speed race is a motorsports race in which racing cars having a configuration of an automobile, an autobicycle, a kart, a snowmobile, or a remote control model car compete against each other.

7. The start indication light system according to Claim 6, characterized in that

the competitor start indication lights are installed on the racing cars in the motorsports race.