front of the viewing point and other sounds are prepared as the sound data. The sound data are stored, for example, in PCM data format and are digital-to-analog converted, filtered and amplified after being read to be outputted from the loudspeakers as sounds.

[0032] In connection with the sound control unit **120**, the CPU **101** is provided with a functional portion for performing a trajectory calculation. The trajectory of the bullet the enemy character displayed on the monitor screen shot at the game player by a shooting control of the CPU **101** is successively calculated based on an information on a firing position and a shooting direction by this functional portion. The image control unit **110** performs a processing of successively drawing the trajectory on the monitor screen based on the successively obtained calculation results (alternatively, only the presentation image at the time of shooting may be pictured without picturing the trajectory). Further, the sound controller **120** is provided with a functional portion for selectively switching the loudspeakers **12**, **21** to output sounds according to, for example, a distance between the calculated trajectory of the bullet and the viewing point of the simulated camera as described later.

[0033] In this game, the CPU **101** is provided with a function of determining whether or not a bullet shot by the enemy character will hit the game player. This judgment is made based on, for example, whether or not any obstacle exists between the enemy character and the viewing point of the simulated camera or whether or not a distance therebetween is fairly long. Alternatively, a hit rate may be set at random and may be suitably changed according to the progress of the game, etc. or may be changed according to a life gauge of the game player. The CPU **101** is also provided with a function of decreasing the life gauge by a specified amount when the game player is shot and a function of judging whether or not the life gauge has decreased to 0.

[0034] Here, the construction and operation of the gun unit **22** is described. In this embodiment, known construction and operation principle are adopted as those of the gun unit **22**. Specifically, the gun unit **22** has an outer configuration similar to that of a gun, and an operation of pulling a trigger biased toward an initial position by a biasing means is detected by detecting a linked movement of a movable piece of a switch and such a detection is introduced in the form of a shooting command signal to the game control unit **100** via the cord **23**. A light detecting sensor is so built in the gun unit **22** as to have a narrow directivity at the muzzle. When the shooting command signal is introduced to the game control unit **100**, the CPU **101** functioning as a shooting position detector of the game control unit **100** interrupts an imaging processing to the monitor **11**, sweeps a luminescent spot in horizontal(H) and vertical (V) directions for, e.g. only one frame, and measures a time which lapses until the light detecting sensor in the gun unit **22** detects this luminescent spot after the start of sweeping. Since a sweeping period for one frame is known from an adopted sweeping method, the gun unit **22** is assumed to have faced at the calculated coordinate position, i.e. to have been fired by inversely calculating the coordinate position of the luminescent spot on the screen of the monitor **11** based on the measured time. Alternatively, a following method may be adopted. An infrared CCD camera is mounted in the muzzle, whereas one or two infrared spot light sources are arranged at fixed positions near the monitor **11**. A direction in which the camera was faced, i.e. a position toward which the gun unit **22** was faced is detected based on coordinates of the spot light source(s) within an image picked up by the CCD camera when the trigger was pulled.

[0035] The CPU **101** successively calculates the trajectory of the bullet shot by the game player in the game space on the screen of the monitor **11** and judges whether or not the shot bullet has hit the enemy character displayed on the screen by preferably causing the bullet to be displayed on the screen every time calculation is made. Whether or not the bullet has hit the enemy character is judged based on the results of the successively calculated trajectory and the coordinates of the position of the enemy character, i.e. based on whether the calculated coordinates of the bullet and the coordinates of the position of the enemy character coincide or substantially coincide.

[0036] Next, detection principle in the position calculator **35** of the head detector **30** is described with reference to **FIG. 3**. An ultrasonic pulse having a wide directivity transmitted from the ultrasonic transmitter **31** is reflected by the body of the game player located therebelow and a part of the reflected pulse is received by the ultrasonic receivers **32**, **33**. Since the game player's head is located at highest in his usual playing action, the pulse signals received by the ultrasonic receivers **32**, **33** can be both assumed to be return waves reflected by the game player's head. The position calculator **35** measures periods which lapse until the rise of the pulse signals received by the ultrasonic receivers **32**, **33** after the ultrasonic pulse was transmitted, and performs a geometric calculation using distance data obtained by converting the measured periods based on an air propagating sound velocity, distances between the ultrasonic transmitter **31** and the ultrasonic receiver **32** and between the ultrasonic transmitter **31** and the ultrasonic receiver **33**, and a height information, thereby calculating the position of the game player's head in height direction and in transverse direction. Specifically, the measured periods at the side of the ultrasonic receiver **32** determine an ellipse having the ultrasonic transmitter **31** and the ultrasonic receiver **32** as foci. Likewise, the measured periods at the side of the ultrasonic receiver **33** determine another ellipse having the ultrasonic transmitter **31** and the ultrasonic receiver **33** as foci. Since the position of the ultrasonic transmitter **31** is same, a bottommost intersection of the two ellipses can be calculated (intersection calculation **351**), the position of the game player's head in height direction and in transverse direction in the space can be determined using the height information of the ultrasonic transmitter **31** and the ultrasonic receivers **32**, **33** (position determination **352**). In order to simplify the calculations, the intersection may be calculated assuming that the game player's head is located right below the ultrasonic transmitter and receivers **31**, **32**, **33**, i.e. only by the calculation of the ellipses. Alternatively, a relationship between the two measured periods (i.e. the two distance data) and the position of the head may be calculated in advance and may be stored in a table format (LUT). The position calculator **35** sends the thus calculated position of the game player's head in height direction and in transverse direction in the space to the game control unit **100** as the viewing point information of the simulated camera. Accordingly, the viewing point of the simulated camera can be so changed or moved as to correspond to the position of the