

control starts to output the respective sounds relating to shooting from the loudspeakers **12** (or both the loudspeakers **12** and **21**) (Step **ST16**).

[**0044**] On the other hand, if the viewing point is switched to the objective one, the game image is formed at the objective viewing point based on the information obtained by the I/O processing (Step **ST17**), and if a shooting battle occurs, the respective sounds relating to shooting are separately outputted from the loudspeakers **12** or the loudspeaker **21** by the interrupt processing (Step **ST18**). Upon completion of the sound processing in Steps **ST16**, **ST18**, it is discriminated whether the current stage has been completed. Unless the current stage has been completed, this subroutine returns to Step **ST11** and the operations of Steps **ST11** to **ST18** are repeated. If it has been completed, this subroutine returns to Step **ST6** to exit therefrom.

[**0045**] **FIG. 10** is a flow chart showing an "Interrupt Processing" in response to shooting from the enemy character in a subroutine "Sound Processing based on a Viewing Point" executed in Step **ST18**. In **FIG. 10**, the interrupt processing for the sound output is started upon firing by the enemy character, and it is discriminated whether a distance in the game space between the object which is supposed to make sounds (sound-making object) and the viewing point is smaller than a threshold value used in judging a long or short distance (Step **ST21**). The sound-making object may be a bullet fired by the enemy character -or an obstacle which is located before the viewing point and on which the fired bullet hits. Specifically, when the bullet from the enemy character hits the obstacle before the viewing point, hitting sounds are outputted from the loudspeaker **21** (Step **ST22**) if the distance to this obstacle is smaller than the threshold value (if it is close) while being outputted from the loudspeakers **12** (Step **ST23**) if the distance is larger than the threshold value (if it is distant).

[**0046**] The sound control unit **120** is provided with a function of judging that the fired bullet passed such a point very close to the viewing point that the bullet is assumed to have hit the game player based on the result of distance between the position of the bullet successively obtained by the trajectory calculation and the viewing point. Upon making such a judgment, the sound controller **120** executes such a presentation as to, for example, temporarily shake the screen, decreases the life gauge by a specified value as a hit processing to the game player (hit-presentation processing) and causes the hitting sounds to be outputted from the loudspeaker **21** (Step **ST22**). If the fired bullet hits neither the obstacle in front of the viewing point nor the game player, a sound of the bullet hurtling through the air is outputted from the loudspeaker **21** at a timing when the calculated distance between the position of the bullet whose trajectory is successively calculated and the viewing point becomes smaller than the threshold value (Step **ST22**). Although other sound effects relating to shooting are outputted from the loudspeakers **12**, the shooting sounds from the game player may be, for example, outputted from the loudspeaker **21**. As described above, the output of the sounds is switched such that the sounds are outputted from the loudspeakers **12** more distant from the game player if the sound-making object is distance from the viewing point, whereas they are outputted from the loudspeaker **21** if it is close to the game player. Thus, a game having an acoustically better presence can be provided.

[**0047**] Upon completion of the sound output processing for a certain sound, it is then discriminated whether the sound output processing for all sounds has been completed, i.e. whether any presentation (hitting on the obstacle before the viewing point, hitting on the game player or missing the game player by passing right beside him) in response to one fired bullet has occurred (Step **ST24**). Step **ST21** follows if no presentation has occurred, whereas this subroutine returns on the assumption that the sound output processing for this bullet has been completed if some presentation has occurred. It should be noted that the number of the loudspeaker **21** is not limited to one, and two loudspeakers **21** may be arranged side by side. In such a case, sounds may be outputted while switching the left and right loudspeakers according to whether the game player's head is located at the left or right side within the play area or a further better acoustic presence may be provided by, for example, the switching of the acoustic effect in transverse direction in addition to the switching thereof according to the distance by adjusting a volume ratio to conform to the situation.

[**0048**] **FIG. 11** is a perspective view showing a second embodiment of the 3D video game machine according to the present invention, and **FIG. 12** is a block construction diagram for the detection of the game player's head. Although this game machine is slightly different from the one shown in **FIG. 1** in appearance, the two game machines are substantially identical in function except the construction of the head detector **30**.

[**0049**] In the second embodiment, a head detector **130** is comprised of, for example, a CCD camera **131** as an image pickup means arranged right below the monitor **11** and in a transversely center position, a background deleting member **132** provided at a side of the play area opposite from the CCD camera **131**, a silhouette image extracting means **133** as a functional portion, a human silhouette characteristic data memory **134** for storing a human silhouette characteristic data and a position determining device **135**. The CCD camera **131** is oriented such that its side toward the play area serves as an image sensing area.

[**0050**] The background deleting member **132** includes a rectangular support **132a** standing at the front side as if it would surround the play area, an upper horizontal coupling arm **132b** to be coupled with the main game unit **10** to hold the support **132a** upright, and a screen **132c** having a stripe pattern of a specified single color such as blue, a two-color stripe pattern or the like adhered to the upper half of the support **132a** on its outer surface. The screen **132c** is of such a size and a form, preferably a rectangular form as to cover a range where the game player's head can be possibly displaced in a usual gaming posture and is provided at such a height position as to cover his head regardless of whether the game player is in his bending posture or in his upright posture. The screen **132c** may be semitransparent, so that people standing behind the screen **132c** can see the game player's movements and images displayed on the monitor **11**.

[**0051**] The CCD camera **131** has such an angle of view that the screen **132c** becomes a visual field, so that background objects (e.g. various objects at an amusement arcade (other game machines, etc.) and people) behind the screen **132c** are not included in a picked image. Preferably, the CCD camera **131** is a color image pickup means in which