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(71) Applicant: **KONAMI GAMING, INCORPORATED**  
[US/US]; 585 Trade Center Drive, Las Vegas, NV 89119 (US).

(72) Inventors: **HIRAI, Tomoaki**; c/o Konami Gaming, Incorporated, Japan Branch, 5-1-1, Higashihara, Zama-Shi,

Kanagawa, 252-0004 (JP). **OMOTO, Toru**; c/o Konami Gaming, Incorporated, Japan Branch, 5-1-1, Higashihara, Zama-Shi, Kanagawa, 252-0004 (JP).

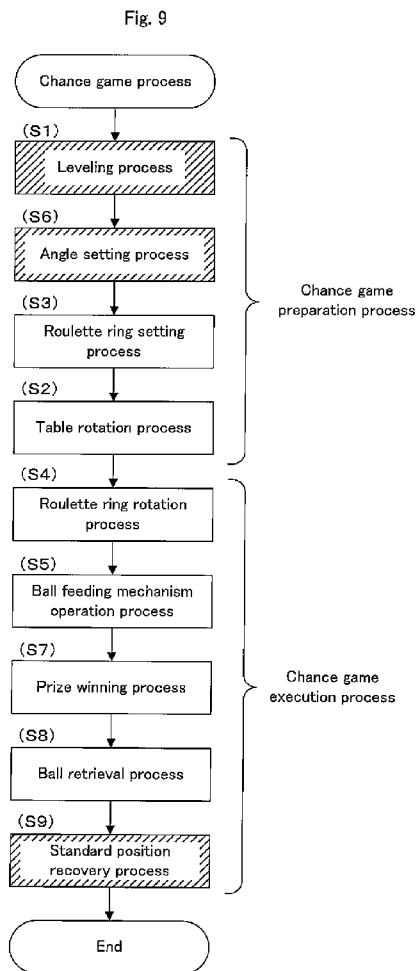
(74) Agents: **YEE, James R.** et al.; Howard & Howard Attorneys PLLC, 450 West Fourth Street, Royal Oak, MI 48067 (US).

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(54) Title: GAME MACHINE WITH PROVISION FOR SHORTENED CHECKING, AND CONTROL METHOD AND COMPUTER PROGRAM USED THEREIN

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(57) Abstract: Provided is a game machine capable of efficiently checking the operation of a physical chance game unit. The game machine (1) includes a chance game unit (LU) that performs a game of chance via predetermined chance game operation when a predetermined provision condition is satisfied. And, the game machine (1) controls the chance game unit (LU) so that, when a predetermined shortening condition is satisfied, the time period required for the predetermined chance game operation is shortened, as compared to when said predetermined provision condition is satisfied.

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## GAME MACHINE WITH PROVISION FOR SHORTENED CHECKING, AND CONTROL METHOD AND COMPUTER PROGRAM USED THEREIN

### TECHNICAL FIELD

[0001] The present invention relates to a game machine that executes a physical game of chance, and so on.

### BACKGROUND ART

[0002] There is a game machine that executes a physical game of chance. And, as one such physical game of chance, there is known a game machine that provides a roulette game (for example, refer to Patent Document #1).

[0003] Patent Literature - Patent Document #1: Japanese Laid-Open Patent Publication 2008 36396.

### SUMMARY OF THE INVENTION

#### TECHNICAL PROBLEM

[0004] A physical game of chance may, for example, be executed by a physical chance game unit. When this type of physical chance game unit is employed, as for example in the case of the game machine of Patent Document #1, the gaming time depends upon physical factors such as the movement of a chance gaming medium and so on. Accordingly, it is often the case that the time taken for the game is not fixed. On the other hand, it is not possible to check upon the operation of a physical chance game unit without actual operation. However, if the physical chance game unit is operated in a similar manner to its operation during the actual game, then it is not possible to forecast the time taken by the game, and in some cases this time may become excessively long. Moreover, it is often the case that the operation of the physical chance game unit may

include a plurality of processes for implementing the game. And, furthermore, these processes may even include processes that are not always executed in each chance game. Accordingly, even if the physical chance game unit is operated in a similar manner to the way it is operated when the actual game is being executed, there is a possibility that it may not be possible to check upon its operation adequately.

[0005] Accordingly, the object of the present invention is to provide a game machine and so on, capable of efficiently checking the operation of a physical chance game unit.

#### MEANS FOR SOLUTION

[0006] In order to solve the above problems, a game machine of the present invention, comprises: a physical chance game unit that performs a game of chance via predetermined chance game operation when a predetermined provision condition is satisfied; and a physical chance game control device adapted and configured to control said physical chance game unit so that, when a predetermined shortening condition is satisfied, the time period required for said predetermined chance game operation is shortened, as compared to when said predetermined provision condition is satisfied.

[0007] According to the present invention, if the predetermined shortening condition is satisfied, the time necessary for the predetermined chance game operation is shortened, as compared with the case in which the predetermined provision condition is satisfied. Accordingly, it is possible to shorten the time period required for checking the predetermined chance game operation by, for example, employing, as this predetermined shortening condition, a condition such as starting, error recovery, or the like. By doing this, it is possible efficiently to check the operation of the physical chance game unit.

[0008] Further, in order to solve the above problems, a control method of the present invention is applied to a game machine comprising a physical chance game unit that

performs a game of chance via a predetermined chance game operation when a predetermined provision condition is satisfied, and the control method comprises a physical chance game control step that controls said physical chance game unit so that, when a predetermined shortening condition is satisfied, the time period required for said predetermined chance game operation is shortened, as compared to when said predetermined provision condition is satisfied.

[0009] Further, in order to solve the above problems, a computer program for a game machine of the present invention is a computer program for a game machine comprising a physical chance game unit that performs a game of chance via a predetermined chance game operation when a predetermined provision condition is satisfied, and wherein the computer program for the game machine is configured so as to cause a computer which is incorporated into the game machine to function as a physical chance game control device adapted and configured to control said physical chance game unit so that, when a predetermined shortening condition is satisfied, the time period required for said predetermined chance game operation is shortened, as compared to when said predetermined provision condition is satisfied. It is possible to actualize a game machine of the present invention by executing the computer program or the control method of the present invention.

#### BRIEF DESCRIPTION OF DRAWINGS

[0010] Fig. 1 is an external appearance diagram of a game machine according to an embodiment of the present invention.

[0011] Fig. 2 is a functional block diagram illustrating a schematic configuration of a control system of a game machine.

[0012] Fig. 3 is an explanatory figure for explaining an example of the chance game process.

[0013] Fig. 4 is an explanatory figure for explaining an example of the operation checking process.

[0014] Fig. 5 is a figure showing an example of this operation checking screen.

[0015] Fig. 6 is a figure showing an example of a flow chart for the operation checking processing routine.

[0016] Fig. 7 is a figure showing an example of a flow chart for the preparation process checking processing routine.

[0017] Fig. 8 is a figure showing an example of a flow chart for the execution process checking processing routine.

[0018] Fig. 9 is an explanatory figure for explanation of a variant embodiment of the chance game process.

#### DESCRIPTION OF EMBODIMENTS

[0019] Hereinafter, a game machine according to an embodiment of the present invention will be described with reference to the accompanying drawings. Fig. 1 is an external appearance diagram of a game machine according to an embodiment of the present invention. As illustrated in Fig. 1, the game machine 1 includes a plurality of station units 2 serving as base game units, a center unit 3, and an outer unit 4. The outer unit 4 is positioned so as to surround the center unit 3 and interposed between the respective station units 2 and the center unit 3. Further, a predetermined gap is formed between the outer unit 4 and the center unit 3 in order to prevent the outer unit 4 and the center unit 3 from coming into contact with each other. The plurality of station units 2

are arranged around the center unit 3 in a circumferential form. Incidentally, in Fig. 1, the three station units 2 are illustrated, but the number of station units 2 may be arbitrary.

**[0020]** For example, the station unit 2 provides a slot game serving as a base game in exchange for consumption of coins. The slot game refers to a well-known game in which displays of symbols change according to a lottery result, and a predetermined prize is given when a combination of changed displays of symbols forms a predetermined winning arrangement. The station unit 2 includes a housing 5. The station monitor 6 is provided on a front surface of the housing 5. A game screen GS used to execute a slot game is displayed on the station monitor 6. For example, a liquid crystal display (LCD) device is used as the station monitor 6. A control panel 7 is provided below the station monitor 6. The control panel 7 includes a coin slot 8 and an operation device 9. For example, the operation device 9 includes an operation member such as a button switch for performing various kinds of operations such as a bet operation. A coin-payout opening 10 is provided below the control panel 7.

**[0021]** Meanwhile, the center unit 3 provides a so-called roulette game (an opportunity of a lottery) when a predetermined provision condition is satisfied on the station unit 2. In other words, an opportunity to play a roulette game is given through the slot game. For example, a condition that is satisfied when specific symbols form a specific arrangement in the slot game is employed as the predetermined provision condition. Incidentally, the predetermined game condition is not limited to this embodiment. For example, a winning arrangement may be used as the specific arrangement. In other words, a condition that is satisfied when specific symbols form a winning arrangement may be employed as the predetermined provision condition. Alternatively, as the predetermined game condition, there may be used various kinds of conditions related to

the slot game such as a condition satisfied when a winning arrangement is formed a predetermined number of times or more, or a condition satisfied when a specific winning arrangement is formed. Further, when a game other than the slot game is executed by the station unit 2, various kinds of conditions related to the game may be employed as the predetermined game condition.

**[0022]** The center unit 3 includes a chance game unit LU serving as a physical chance game unit. The chance game unit LU includes a roulette game unit RG. The roulette game unit RG is arranged on a rotatable table (not illustrated). Further, the roulette game unit RG includes a center monitor 11, a roulette ring 12 serving as a rotating body, a ball feeding mechanism 13, and a ball guide path 14 serving as a medium guidance path. The roulette ring 12 is formed so as to have a circular shape. Further, the roulette ring 12 is arranged such that a front side (a side at which the station unit 2 is arranged) is positioned downwardly, a rear side of an opposite side is positioned upwardly, and so the roulette ring 12 is inclined. Further, the roulette ring 12 is arranged below the center monitor 11 so that the rear side, that is, an upper portion of the inclination is hidden by the center monitor 11. Furthermore, a ring drive mechanism 15 (refer to Fig. 2) is provided in the roulette game unit RG. The roulette ring 12 is rotationally driven in a predetermined direction at a predetermined speed by the ring drive mechanism 15, and then stops at an appropriate timing. That is, the roulette ring 12 is arranged so as to be rotatable. Further, the roulette ring 12 is configured to be rotatable in both of a clockwise direction (right-hand rotation) and a counterclockwise direction (left-hand rotation). Around the roulette ring 12, a plurality of pockets 16 serving as reception sections are provided along an outer circumference. There is a height difference between the pockets 16 due to the inclination. Each pocket 16 is associated with a predetermined prize.



[0023] The ball feeding mechanism 13 is a mechanism for feeding a ball B serving as a chance gaming medium to the ball guide path 14. In other words, the ball B is fed to the ball guide path 14 by the ball feeding mechanism 13. The ball guide path 14 is formed so as to extend along the outer circumference of the roulette ring 12. A guard 14g for limiting a movement of the ball B is provided at an outer circumference side of the ball guide path 14, i.e., the opposite side of the roulette ring 12. The guard 14g limits the movement of the ball B so as to prevent the ball B from being led astray from the ball guide path 14. In other words, the ball guide path 14 is formed so that the ball guide path 14 limits a moving range of the ball B fed by the ball feeding mechanism 13 to a certain range and the ball B can be guided to the pocket 16 side of the roulette ring 12. Further, the ball guide path 14 is configured so that a tilt angle toward pocket 16 side is adjustable. And, at an appropriate timing, the ball B is received in any one of pockets 16. A ball detecting sensor (not illustrated) is provided in each pocket 16 so as to be able to detect the pocket 16 into which the ball B has gone.

[0024] Meanwhile, the center monitor 11 includes three monitors 11l, 11m, and 11r. The three monitors 11l, 11m, and 11r are used so as to function as one center monitor. Here, when the three monitors 11l, 11m, and 11r need not be distinguished from one another, the monitors 11l, 11m, and 11r may be collectively referred to as a “center monitor 11.” The center monitor 11 displays an image for making up for the hidden portion of the roulette ring 12. Specifically, as illustrated in Fig. 1, the center monitor 11 displays a roulette image RI corresponding to the hidden portion of the roulette ring 12 such that the roulette image RI has continuity with the roulette ring 12. While the roulette ring 12 rotates, the roulette image RI corresponding to the roulette ring 12 displayed on the center monitor 11 rotates so as to virtually show the rotation of the

roulette ring 12. Similarly, when the roulette ring 12 stops, the roulette image RI displayed on the center monitor 11 also stops. In other words, the center monitor 11 displays a moving image for rendering rotation and stop effects of the hidden portion of the roulette ring 12 using the roulette image RI. The display of the roulette image RI is actualized by simulating an operation of the roulette ring 12, that is, rotation and stop of the roulette ring 12.

**[0025]** As described above, the roulette ring 12 is arranged so as to be inclined. Therefore, the roulette game unit RG has adequate provision direction for providing the roulette game. And, when any station unit 2 satisfies a predetermined provision condition, the table rotates such that the provision direction of the roulette game unit RG faces a direction of the station unit 2. A direction extending from the center of rotation of the roulette ring 12 toward the lowermost position is used as the provision direction. In other words, the table rotates such that the station unit 2 which satisfies the predetermined provision condition is positioned on an extended line in the direction extending from the center of rotation of the roulette ring 12 toward the lowermost position. Then, the center unit 3 starts to provide the station unit 2 with a roulette game.

**[0026]** Specifically, when the roulette game starts, the roulette ring 12 starts to rotate. The rotation direction of the roulette ring 12 is determined at random. Further, the ball B is fed to the ball guide path 14 by the ball feeding mechanism 13. The fed ball B moves along the ball guide path 14. Since the roulette ring 12 is inclined such that the front side is positioned downwardly, the ball guide path 14 is similarly inclined. Thus, the fed ball B moves toward the opposite side of the ball feeding mechanism 13 along the ball guide path 14, but the ball B changes its moving direction in the middle of the inclination and so moves to return to the ball feeding mechanism 13 side. After this movement is repeated

several times, the moving range of the ball B converges to the lowermost position of the ball guide path 14, that is, the lowermost position of the roulette ring 12. Then, the ball B goes into any one pockets 16 (mainly, the pocket 16 positioned at the lowermost position at an appropriate timing) of the roulette ring 12 at an appropriate timing. A predetermined prize associated with the pocket 16 into which the ball has gone is given to the player.

[0027] Next, a configuration of a control system of the game machine 1 will be described with reference to Fig. 2. Fig. 2 is a functional block diagram illustrating a schematic configuration of a control system of the game machine 1. As illustrated in Fig. 2, the game machine 1 includes a station control unit 20 and a center control unit 30. The station control unit 20 and the center control unit 30 are configured as a computer unit that controls the station unit 2 or the center unit 3. Specifically, the station control unit 20 and the center control unit 30 are configured as a computer unit that includes a microprocessor and other peripheral devices such as a main storage device necessary for an operation thereof. The station control unit 20 is provided for each station unit 2 as a component of the station unit 2. The center control unit 30 and each station control unit 20 are connected to each other so that transmission and reception of information can be performed therebetween.

[0028] The station control unit 20 is connected to an external storage device 21. As the external storage device 21, for example, there is used a storage medium that retains stored information after power is turned off such as a magnetic storage medium including a hard disk (HD) or the like, an optical storage medium including a digital versatile disc read only memory (DVD-ROM) or the like, or a non-volatile semiconductor memory including an electrically erasable programmable read only memory (EEPROM) or the

like. The external storage device 21 stores a game program 22 and game data 23. The game program 22 refers to a program necessary for the station unit 2 to execute the slot game. The game data 23 refers to a variety of data used to execute the game program 22. The game program 22 is appropriately read and executed by the station control unit 20. The game data 23 is appropriately read and referred to by the station control unit 20. Incidentally, the game program 22 includes a variety of program modules necessary for executing a game, but an illustration thereof is not made. Similarly, the game data 23 further includes a variety of data such as reel data, sound effect data, and dividend data, but an illustration thereof is not made.

[0029] By the execution of the game program 22, a slot game providing unit 25 is installed in the station control unit 20. The slot game providing unit 25 executes a process necessary for the station unit 2 to provide a slot game. For example, the slot game providing unit 25 executes various kinds of processes such as a process of changing a display of symbols, a process of generating a random number with a predetermined number of digits, a process of executing a choice of symbols to be displayed after a change using the random number, and a process of determining whether or not a predetermined winning arrangement has been formed based on a plurality of symbols after a change. The slot game providing unit 25 is a logical device actualized by a combination of a microprocessor and software. Incidentally, a random number may be generated by a physical device into which an electronic circuit is incorporated. Further, logical devices or physical devices necessary to implement a slot game are appropriately provided in the station control unit 20, but an illustration thereof is not made.

[0030] Further, the operation device 9 and the station monitor 6 described above are connected to the station control unit 20. The operation device 9 outputs a signal

corresponding to a player's operation to the station control unit 20. The station monitor 6 displays an image corresponding to an image signal output from the station control unit 20. The station control unit 20 executes a game by a predetermined procedure according to the game program 22 with reference to the output signal of the operation device 9. Thus, the station control unit 20 causes the game screen GS corresponding to a status of a slot game to be displayed on the station monitor 6.

**[0031]** Further, a coin feeding device 26 and a dispensing device 27 as an input device and an output device necessary to execute a slot game are connected to the station control unit 20. The coin feeding device 26 receives a fed coin serving as a consideration for playing a game through the coin slot 8. Then, the coin feeding device 26 outputs a signal corresponding to an amount of fed coins (value of fed coins) to the station control unit 20.

**[0032]** The dispensing device 27 pays coins to a player as a dividend of a game according to an instruction from the station control unit 20. A coin is paid through the coin-payout opening 10. Incidentally, a consideration to be received and a dividend for a player are not limited to a coin. For example, a medal, a token, or the like may be used as an alternative currency. Alternatively, an accounting method capable of exchanging a currency value or a game value through an exchange of an electronic currency or other electronic information may be used. In this case, an information communication device for mutually exchanging electronic information, a storage medium for storing exchanged information, and the like may be used instead of the coin slot 8 and the coin-payout opening 10. Further, various kinds of devices necessary to execute a slot game can be additionally connected to the station control unit 20, and an illustration thereof is not made.

[0033] On the other hand, the roulette game unit RG that includes the center monitor 11 and so on described above is connected to the center control unit 30. The chance game unit LU includes the roulette game unit RG described above, table, a leveling machine 17, a rotation drive source 18, and camera 19. As a result, the roulette game unit RG including the center monitor 11 described above or the like, the leveling machine 17, the rotation drive source 18, and the camera 19 are connected to the center control unit 30. Moreover, the ring drive mechanism 15 described above is also provided to the roulette game unit RG. Accordingly, the center monitor 11, the ball feeding mechanism 13, the ring drive mechanism 15 and so on that are provided to the roulette game unit RG are controlled by the center control unit 30. In this control, there is included a control of the tilt angle of the ball guide path 14. Moreover, as described above, the ring drive mechanism 15 not only rotationally drives the roulette ring 12, but also stops its rotation (including decelerating it). As a result, for example, the starting and stopping (including deceleration) of the rotation of the roulette ring 12, and its direction of rotation, are also controlled by the center control unit 30 via the ring drive mechanism 15.

[0034] The leveling machine 17 is a machine for adjusting the angle of installation of the table described above. The roulette game unit RG is mounted upon the table. In other words, the leveling machine 17 is used for adjusting the angle of installation of the roulette game unit RG. And the leveling machine 17 is controlled by the center control unit 30. In concrete terms, for example, the center control unit 30 controls the leveling machine 17 so that the tilting at any tilted point is cancelled, the roulette game unit RG is disposed horizontally. Moreover, the rotation drive source 18 is a drive source for rotationally driving the table. In other words, the rotation of the table is controlled by the center control unit 30 via the rotation drive source 18. For example, the center control

unit 30 may control the rotation of the table via the rotation drive source 18 so that the provision direction points to the direction of each of the station units 2. The camera 19 is arranged so as to perform photography at the instant that the ball B enters into a pocket 16, in other words at the instant of winning a prize. The timing of photography by the camera 19 and its photographic angle and so on are controlled by the center control unit 30. Moreover, the result of photography by the camera 19 is outputted to the center control unit 30. As one example, the camera 19 may include a right side camera that is arranged to perform photography from the right side of the pocket 16 into which the ball B enters, and a left side camera that is arranged to perform photography from the left side of the pocket 16 into which the ball B enters. Incidentally while, apart from the above apparatus, other devices and mechanisms of various types and so on that are necessary for provision of the roulette game are connected to the center control unit 30, these are not shown in the drawings.

**[0035]** Further, the center control unit 30 is connected to an external storage device 31. As the external storage device 31, for example, there is used a storage medium that retains stored information after power is turned off such as a magnetic storage medium including a HD or the like, an optical storage medium including a DVD-ROM or the like, or a non-volatile semiconductor memory including a EEPROM or the like. The external storage device 31 stores a center unit program 32 and center unit data 33. The center unit program 32 refers to a program necessary for the center unit 3 to execute the roulette game. The center unit data 33 refers to various kinds of data used to execute the center unit program 32. The center unit data 33 includes various kinds of data such as sound effect data, dividend data, and data for associating each pocket 16 with a predetermined prize. The center unit program 32 is appropriately read and executed by the center

control unit 30. The center unit data 33 is appropriately read and referred to by the center control unit 30. Incidentally, the center unit program 32 includes various kinds of program modules necessary to execute a roulette game, but an illustration thereof is not made.

**[0036]** By the execution of the center unit program 32, a roulette game providing unit 35 is installed in the center control unit 30. The roulette game providing unit 35 executes a process necessary for the center unit 3 to provide the roulette game. For example, the roulette game providing unit 35 executes various kinds of processes such as a process for controlling the leveling machine 17, a process for controlling rotation drive source 18, a process for controlling the ball feeding mechanism 13, a process for controlling the tilt angle of the ball guide path 14, or a process for controlling the ring drive mechanism 15.

**[0037]** Next, the chance game process will be explained, from after one of the station units 2 has satisfied the predetermined provision condition until the center unit 3 has finished provision of the roulette game. Fig. 3 is an explanatory figure for explaining an example of the chance game process. The roulette game is implemented via this chance game process. In other words, the chance game process is a process for implementing chance game operations of various types that are executed by the chance game unit LU in order to provide the roulette game. As illustrated in Fig. 3, the chance game process includes a chance game preparation process and a chance game execution process serving as an execution process. The chance game preparation process is a process of executing preparations for the chance game unit LU to provide the roulette game. On the other hand, the chance game execution process is a process for the chance game unit LU actually to perform the roulette game. And the chance game process is started in order of the chance game preparation process and the chance game execution process.



Moreover, various types of operations that are implemented by the chance game process serve as examples of the "predetermined chance game operation" of the Claims.

[0038] In concrete terms, the chance game preparation process includes a leveling process and a table rotation process serving as a preparation process. On the other hand, the chance game execution process includes a roulette ring setting process, a roulette ring rotation process, a ball feeding mechanism operation process, an angle setting process, a prize awarding process, a ball retrieval process, and a standard position recovery process. Moreover, the leveling process, the angle setting process, and the standard position recovery process shown by the rightward hatched boxes in the figure are processes for which there is a possibility that they will be performed once each time that the chance game is performed some fixed plural number of times. In other words, they are not always performed in every actual chance game. On the other hand, the other processes are performed in each chance game. And this leveling process, angle setting process, and standard position recovery process are examples of the "abnormal process" of the Claims.

[0039] In the chance game process, if, at first, a condition such as at a time of installation or translation of the center unit 3 has been satisfied, then a leveling process (S1) is executed. This leveling process is a process for adjusting, with the leveling machine 17, the angle of installation of the table (and, as a result, the angle of installation of the roulette game unit RG) to the horizontal position. In the leveling process, for example, adjustment to the horizontal position may be performed on the basis of the output of a sensor (not shown in the figures) that detects the horizontal position. Incidentally, the leveling process is not limited to the adjustment to the horizontal position. As an example, the adjustment of the angle of installation of the table may be

executed based on a predetermined adjustment condition. As the predetermined adjustment condition, there may be employed the actual average gaming time based upon past experience. In more concrete terms, as one example, the predetermined adjustment condition may be considered as being satisfied and the angle of installation of the table may be adjusted with the leveling mechanism 17, if the average gaming time in the past is greater than some threshold value. As the threshold value, for example, a value may be used that would be supposed if the table were arranged in a horizontal orientation. In other words, as one example, if there is a possibility that the table is not horizontal and that the roulette ring 12 is at an unintended tilt, then the angle of the table is adjusted so that the average gaming time becomes lower than the threshold value. It should be understood that the predetermined adjustment condition is not limited to being a condition that employs a threshold based upon the average gaming time. It would be acceptable to employ various types of condition as predetermined adjustment conditions for adjustment of the gaming time.

**[0040]** Next, in a table rotation process (S2), the roulette game unit RG rotates. In more concrete terms, the table is rotated so that the provision direction of the roulette game unit RG is pointed in the direction of the station unit 2 that satisfies the predetermined provision condition. And next, in a roulette ring setting process (S3), settings of various types are established for the roulette ring 12. As one example, if the roulette ring 12 is built so that it is possible to change the relationship between its pockets 16 and the corresponding predetermined prizes, then settings for changing this relationship may be included in these various settings. Furthermore, for example, a structure in which a display unit is provided for displaying a prize over each of the pockets 16 may be employed as a structure for making it possible to change the

relationship between the pockets 16 and the predetermined prizes. In this case, the relationship between the pockets and the predetermined prizes may be changed by changing the details of the prizes displayed by the display unit. Moreover, display devices such as liquid crystal displays or the like may be employed as the display units. Or, it would also be acceptable to employ a structure in which the roulette ring 12 is built as a multi-layer construction with a layer that includes a display unit and one or more layers that include the pockets 16 that can be separated, and in which these layers can be rotated relatively to one another, thereby changing the relationship between the pockets 16 and the predetermined prizes. In this case, settings as to which of the layers are separated, are relatively rotating, are stopped, or are fixed may be included within the various settings.

[0041] Next, in a roulette ring rotation process (S4), the rotation of the roulette ring 12 is started. As described above, the rotation direction of the roulette ring 12 is determined randomly. However, the possibility that this direction of rotation is determined as being clockwise is set to be higher. Accordingly, in this roulette ring rotation process, the roulette ring 12 rotates more often in the clockwise rotational direction.

[0042] Next, in a ball feeding mechanism operation process (S5), a ball B is introduced by the ball feeding mechanism 13. As a result, due to the ball feeding mechanism operation process, the ball B starts to shift along the ball guide path 14. As one example, a door may be provided at an introduction aperture through which the ball B is introduced. In this case, this process includes opening and closing of this door.

[0043] Next, an angle setting process (S6) is a process that is executed when a predetermined elevation condition is satisfied. In this angle setting process, the tilt angle of the ball guide path 14 is adjusted so that the ball B is guided towards the pockets 16.

In more concrete terms, in this angle setting process, if the predetermined elevation condition is satisfied, the tilt angle of the ball guide path 14 is elevated so that the tilting of the ball guide path 14 slopes more towards the pockets 16 (i.e. so that the ball B is guided more towards the side of the pockets 16). In other words, in this angle setting process, the tilting of the ball guide path 14 is controlled so that it becomes easier for the ball B to fall into the pockets 16. As the predetermined elevation condition, for example, the actual average gaming time based upon past experience may be used. In other words, as one example, the predetermined elevation condition may be considered as being satisfied and the tilt angle of the ball guide path 14 may be elevated, if the time period from when the ball B is introduced until it falls into one of the pockets 16 is longer than the average gaming time.

**[0044]** Next in a prize awarding process (S7), the ball B shifts along the ball guide path 14 and enters into one of the pockets 16 at an appropriate timing. Moreover, in this process, sensors in each of the pockets 16 determine into which one of the pockets 16 the ball B has fallen. Next, in a ball retrieval process (S8), the ball B is retrieved from the pocket 16 into which it has fallen. In concrete terms, the roulette ring 12 is rotated so that the ball B is retrieved by a ball retrieval mechanism (not shown in the figures) that is provided in the portion hidden by the center monitor 11. In other words, in this process, the roulette ring 12 is rotated so that the pocket 16 into which the ball B has fallen is shifted to the portion which is hidden by the center monitor 11.

**[0045]** Next, a standard position recovery process (S9) is executed if the angle setting process of the step S6 was previously executed. In this standard position recovery process, the tilt angle of the ball guide path 14 is lowered so as to be returned to its original angle. And the chance game process ends together with the end of the standard

position recovery process (if this process is not executed, together with the end of the ball retrieval process). The roulette game is provided by this type of chance game process.

[0046] As described above, the center unit 3 provides the roulette game by employing the operation of the physical chance mechanism such as the ball B and so on. The operation of this type of physical chance mechanism is checked at an appropriate timing. The flow when checking the chance game process of the center unit 3 will now be explained with reference to Fig. 4. During this checking, all of the operations that can be executed during the chance game process are checked, also including processes that are not limited to being executed each time the chance game process is executed. Accordingly, in order to shorten the time period required for checking, the processes that are included in the chance game process are executed in a different order from their order during the actual chance game process. Moreover, the processes that can be executed in parallel with one another among those are executed in parallel. Incidentally, it should be understood that this checking may be executed at timings of various types: for example, upon starting of the center unit 3, upon recovery from errors of various types, during testing, and so on.

[0047] Fig. 4 is an explanatory figure for explaining an example of the operation checking process. This operation checking process is executed in order to check various types of operation of the chance game unit LU, or, in more concrete terms, in order to check operations of various types that are included in the chance game process. Moreover, as one example, the operation checking process is executed when a predetermined shortening condition is satisfied. As described above, this predetermined shortening condition may, for example, be considered as being satisfied upon starting, or upon recovery from errors of various types or the like. As illustrated in Fig. 4, as one

example, various processes of the chance game preparation process and various processes of the chance game execution process that are executed in series in the chance game process, are executed in parallel with one another in the operation checking process, so that the time needed for the chance game preparation process and for the chance game execution process is shortened as compared with the case of the chance game process. In concrete terms, a first leveling process (S11) is executed in the operation checking process, in a similar manner to the case in the chance game preparation process during the chance game process. However, this leveling process is executed each time the operation checking process is performed, and this is different from the case in the chance game process. Moreover, in the leveling process, both the operation of the leveling machine 17 to increase the angle of the table, and also its operation to decrease that angle, are executed. Furthermore, the leveling machine 17 also executes the operation of adjusting the table to horizontal. Incidentally, it should be understood that, in the leveling process (S1) of the chance game process, it is not always the case that all of these operations are executed. It is often the case that, in the leveling process (S1) of the chance game process, only one of these operations is executed.

**[0048]** Next, in a table rotation process (S12), rotation of the table is performed in a similar manner to the case in the chance game process. While, in the table rotation process (S2) of the chance game process, either rotation in the clockwise rotational direction or rotation in the anticlockwise rotational direction is performed, in the table rotation process (S12) of the operation checking process, rotation in both those directions is performed each time.

**[0049]** On the other hand, in the operation checking process, during the chance game execution process, a first angle setting process (S21) is executed almost simultaneously

with the leveling process. In the chance game process, this angle setting process is executed as the step S6, after the roulette ring setting process (S3) and so on. However, in the operation checking process, it is performed at the start of the chance game execution process. In other words, in the operation checking process, the order of starting the various processes is different as compared to the case of the chance game process. In concrete terms, in the chance game process, the angle setting process (S6) is executed after the roulette ring setting process (S3), the roulette ring rotation process (S4), and the ball feeding mechanism operation process (S5). On the other hand, in the operation checking process, the angle setting process (S21) is performed before the roulette ring setting process (S22), the roulette ring rotation process (S23), and the ball feeding mechanism operation process (S24). Moreover, the angle setting process (S21) is executed each time, and this is different from the case in the chance game process.

**[0050]** Next, the roulette ring setting process (S22), the roulette ring rotation process (S23), the ball feeding mechanism operation process (S24), the prize awarding process (S25), and the ball retrieval process (S26) are executed in that order. In the roulette ring rotation process, first rotation in the anticlockwise rotational direction is performed, and the ball B is introduced to the ball guide path 14 by the ball feeding mechanism 13 at left side. And, after the subsequent processes have been executed through the end, then the processes subsequent to the roulette ring rotation process are executed a second time with rotation (in this case, the ball B is introduced to the ball guide path 14 by the ball feeding mechanism 13 at right side) in the opposite direction (i.e. in the clockwise rotational direction). In other words, the operations that are included when providing the roulette game, both in rotation in the clockwise rotational direction and in rotation in the anticlockwise rotational direction, are checked by a similar flow to the flow when the

roulette game is being provided. In the chance game process, the rotation direction of the roulette ring 12 is performed either in the clockwise rotational direction or in the anticlockwise rotational direction. In concrete terms, in the chance game process, each of the processes from the roulette ring rotation process (S4) to the ball retrieval process (S8) is executed in, alternatively, either the clockwise rotational direction or the anticlockwise rotational direction. In other words, the processes from the roulette ring rotation process to the ball retrieval process that, in the operation checking process, are executed in the clockwise rotational direction, and the processes that are executed in the anticlockwise rotational direction, are executed alternatively in the chance game process. By contrast, these processes that are alternatively executed in the chance game process in this way, are both executed in the operation checking process. Furthermore, each of the operations which are performed in the case of rotation in the anticlockwise rotation direction which occurs less frequently stochastically is executed each time in the operation checking process. And, finally, the standard position recovery process (S27) is executed.

[0051] The chance game preparation process mainly involves operations that correspond to the table, while the chance game execution process mainly involves operations that correspond to the roulette game unit RG. Accordingly, they can be executed in a mutually independent manner. Due to this, as described above, the chance game preparation process and the chance game execution process are executed in parallel with one another. Moreover, the tilt angle of the ball guide path 14 exerts an influence upon the gaming time (the time for the prize awarding process). Accordingly this is performed first, in order to shorten the time period for the subsequent processes. Due to these facts, the time period for all of these processes to be completed, in other words the



time period needed for the chance game execution process, is shortened as compared to the chance game process. Incidentally, it should be understood that the various processes within the chance game preparation process or within the chance game execution process may also be executed in parallel with one another. For example, it would be acceptable to start the roulette ring setting process (S22) while executing the angle setting process (S21). Moreover, apart from the processes (or operations) described above, other processes and so on of various types that are required for providing the roulette game may be included in the operation checking process. As one example, if decorative lighting is used while the roulette game is being provided, a process that checks the operation of this decorative lighting may be included in the operation checking process. Furthermore, as an example, this process may also be executed during the prize awarding process (S25).

**[0052]** The result of the operation checking process may, for example, be confirmed using an operation checking screen. Fig. 5 is a figure showing an example of this operation checking screen. As illustrated in Fig. 5, the operation checking screen 40 includes a portion that shows various processes such as "leveling" and so on, a portion that shows the results or progress of checking such as "OK" or the like, and a portion that shows the result of photography by the camera 19. In the example of Fig. 5, "leveling" denotes the leveling process, "table" denotes the table rotation process, "roulette ring" denotes the roulette ring setting process, "left game" denotes the processes in the clockwise rotational direction from the roulette ring rotation process to the ball retrieval process, and "right game" denotes similar processes in the anticlockwise rotational direction. Moreover, for each of these processes, "OK" is displayed if no problem has arisen, and "checking" is displayed for processes which are being checked. And the

progress for each process is shown by this display. On the other hand, the result of photography by the camera 19 is displayed as photographic images 41. Here, as one example, the result of photography by the right camera 19 is displayed as a right camera photographic image 41R, while the result of photography by the left camera 19 is displayed as a left camera photographic image 41L. The results of checking and the progress for each of the processes are shown visually via the operation checking screen 40 in this manner.

[0053] Next, the operation checking processing, the preparation process checking processing, and the execution process checking processing will be explained. The operation checking processing is processing for performing the operation checking process. In more concrete terms, the operation checking processing is processing for executing the chance game preparation process and the chance game execution process in parallel with one another. The preparation process checking processing is processing for executing the chance game preparation process of the operation checking process. And the execution process checking processing is processing for executing the chance game execution process of the operation checking process. As one example, these processing operations are executed by the center control unit 30 via the roulette game providing unit 35. Incidentally, it should be understood that while, in order to provide the roulette game and the slot game, the center control unit 30 and the station control unit 20 execute for example various types of known processing and so on other than the processing mentioned above with the roulette game providing unit 35 and the slot game provision section 25, detailed explanation thereof will be omitted.

[0054] Fig. 6 is a figure showing an example of a flow chart for the operation checking processing routine. As one example, the routine of Fig. 6 may be executed on a

predetermined cycle. When the routine of Fig. 6 starts, in a first step S51, the roulette game providing unit 35 determines whether or not the predetermined shortening condition is satisfied. For example, a predetermined operation that commands operation checking may be employed as the predetermined shortening condition. In this case, the predetermined shortening condition is satisfied if the predetermined operation that commands operation checking has been performed. Incidentally, it should be understood that this type of predetermined operation may, for example, be executed when the center unit 3 is started, when it recovers from an error, and the like.

**[0055]** If the result of the determination in the step S51 is negative, in other words if the predetermined shortening condition is not satisfied, then the roulette game providing unit 35 skips the subsequent processing, and this cycle of the routine terminates. On the other hand, if the result of the determination in the step S51 is affirmative, in other words if the predetermined shortening condition is satisfied, then the roulette game providing unit 35 proceeds to a step S52. In this step S52, the roulette game providing unit 35 commands the starting of the preparation process checking processing. And next, in a step S53, the roulette game providing unit 35 further commands the starting of the execution process checking processing. And, when the processing of the step S53 has been completed, the roulette game providing unit 35 terminates this cycle of the routine. Due to this, the start of the preparation process checking processing and the start of the execution process checking processing are commanded at almost the same time.

**[0056]** Fig. 7 is a figure showing an example of a flow chart for the preparation process checking processing routine. As one example, the routine of Fig. 7 may be executed on a predetermined cycle. When the routine of Fig. 7 starts, in a first step S61, the roulette game providing unit 35 determines whether or not starting of the preparation process

checking processing has been commanded. If the result of this determination is negative, in other words if this starting has not been commanded, then the subsequent processing is skipped and this cycle of the routine terminates.

**[0057]** On the other hand, if the result of the determination in the step S61 is affirmative, in other words if starting has been commanded, then the roulette game providing unit 35 proceeds to a step S62. In this step S62, the roulette game providing unit 35 performs the leveling process (S11). And next, in a step S63, the roulette game providing unit 35 performs the table rotation process (S12). And when the processing of the step S63 has been completed, the roulette game providing unit 35 terminates this cycle of the routine. The chance game preparation process of the operation checking process is performed in this manner.

**[0058]** Fig. 8 is a figure showing an example of a flow chart for the execution process checking processing routine. As one example, the routine of Fig. 8 may be executed on a predetermined cycle. When the routine of Fig. 8 starts, in a first step S71, the roulette game providing unit 35 determines whether or not starting of the execution process checking processing has been commanded. If the result of this determination is negative, in other words if this starting has not been commanded, then the subsequent processing is skipped and this time of the routine terminates.

**[0059]** On the other hand, if the result of the determination in the step S71 is affirmative, in other words if starting has been commanded, then the roulette game providing unit 35 proceeds to a step S72. In this step S72, the roulette game providing unit 35 performs the angle setting process (S21). Next, in a step S73, the roulette game providing unit 35 performs the processes for providing a left game. In concrete terms, the roulette game providing unit 35 employs the clockwise rotational direction as the direction of rotation of

the roulette ring 12, and performs the roulette ring setting process (S22), the roulette ring rotation process (S23), the ball feeding mechanism operation process (S24), the prize awarding process (S25), and the ball retrieval process (S26).

**[0060]** Next in a step S74 the roulette game providing unit 35 performs the processes for providing a right game. In concrete terms, the roulette game providing unit 35 employs the anticlockwise rotational direction as the direction of rotation of the roulette ring 12, and performs the roulette ring rotation process (S23), the ball feeding mechanism operation process (S24), the prize awarding process (S25), and the ball retrieval process (S26). And next in a step S75 the roulette game providing unit 35 performs the standard position recovery process (S27), and then this time of the routine ends. Due to this, the processes for executing the chance game are executed in a different order from their order during the chance game process. Moreover, by the routines of Figs. 6 through 8 being executed, the chance game preparation process and the chance game execution process are executed in parallel with one another.

**[0061]** As has been explained above, according to this embodiment, operation checking processes that are different from the chance game process are provided for checking the operation of the chance game unit LU. And operations that occur with low frequency are also included in the operation checking process, so that all of the operations that are executed during the chance game process are executed. Furthermore, in the operation checking process, some of the processes are executed in parallel with one another. Moreover, in the operation checking process, the angle setting process is positioned before the processes for supplying a left game and a right game. In other words, the order of some of the processes is transposed. The angle setting process is executed in the chance game process when gaming time is longer than the average gaming time based on

the predetermined elevation condition. Therefore, the average time is needed by the end of the chance game preparation process at least. On the other hand, in the angle setting process, the tilt angle of the ball guide path 14 is elevated every time without relation to the predetermined elevation condition. For this reason, time necessary for the chance game becomes shorter than at least the average time. As a result, the time period needed for the prize awarding process is shortened. Accordingly in the operation checking process the time period for checking is shortened, as compared to case in which the processes were executed in a similar order to the chance game process. Due to this, it is possible to check the operation of the chance game unit LU in an efficient manner.

**[0062]** In contrast, as described above, in the operation checking process, the processes are executed in a different order from their order in the chance game process. Moreover, some of the processes are executed in parallel with one another. As a result, in the operation checking process, it is difficult to ascertain whether or not the processes are operating correctly, since they are not in sequential manner. Due to this, in this embodiment, the progress of the operation checking process is shown visually via the operation checking screen 40. And, because of this, it is possible to provide the state of each of the operations (i.e. of each of the processes) which are not in sequential manner visually in an easily understandable manner.

**[0063]** In the embodiment described above, by executing the routines of Figs. 6 through 8 with the roulette game providing unit 35, the center control unit 30 serves as an example of the "physical chance game control device" of the Claims.

**[0064]** The present invention is not to be considered as being limited to the embodiment described above; it could be implemented in any of various appropriate ways. In the embodiment described above, the time period needed for checking is shortened by

changing the order of the processes. However, shortening of the checking time period is not limited to this sort of method. For example, during the prize awarding process, it would also be acceptable further to perform the operation of decelerating the rotation of the roulette ring 12. In other words, the ring drive mechanism 15 may be controlled by the center control unit 30 so as to decelerate the rotation of the roulette ring 12 during the prize awarding process. In this case as well, it is possible to check the operation of the chance game unit LU in an efficient manner, since it is possible to shorten the time period required for checking.

**[0065]** Moreover, in the embodiment described above, the predetermined shortening condition was satisfied when a predetermined operation was executed. In more concrete terms, a condition that is satisfied in cases necessary for checking the operation of the chance game unit LU such as starting time and so on, is employed as the predetermined shortening condition. However, the predetermined shortening condition is not limited to being a condition of this type. For example, it would also be acceptable for the predetermined shortening condition to be satisfied during provision of the roulette game. In other words, during supply of the roulette game, it would also be acceptable to perform processes so as to shorten the gaming time, that are different from those performed during the normal chance game process.

**[0066]** Furthermore, the order of the various processes included in the chance game process is not to be considered as being limited to that shown in the embodiment described above. Fig. 9 is an explanatory figure for explanation of a variant embodiment of the chance game process. For example, as illustrated in Fig. 9, in the chance game process, a leveling process (S1), an angle setting process (S6), a roulette ring setting process (S3), a table rotation process (S2), a roulette ring rotation process (S4), a ball

feeding mechanism operation process (S5), a prize winning process (S7), a ball retrieval process (S8), and a standard position recovery process (S9) may be executed in order. And it would also be acceptable to add an angle setting process and a roulette ring setting process to the chance game preparation process. In this case, it would also be acceptable not to limit the angle setting process to elevation of the ball guide path 14, but also to allow lowering thereof. In concrete terms, for example, if the time period taken by the game of chance is shorter than the average game of chance time period, then it would be acceptable to lower the tilt angle of the ball guide path 14 so as to make the game of chance time period longer. In this type of case, for example, the above described adjustment condition may be employed in the angle setting process, instead of the predetermined elevation condition. Moreover, in the standard position recovery process, it would be acceptable to perform elevation of the tilt angle of the ball guide path 14, so that the tilt angle of the ball guide path 14 is returned to the angle before the angle setting process. On the other hand, even in this case, as an example, the embodiment similar to Fig. 4 may be employed as the operation checking process. In this case, it is also possible to shorten the time period for checking since at least the leveling process and the angle setting process is executed in parallel.

**[0067]** In the embodiment described above, a slot game is employed as the base game, while the physical chance game unit supplies a roulette game. However, the base game and the chance game supplied by the physical chance game unit are not to be considered as being limited to embodiments of these types. Various types of game and chance game may be employed as the base game and the chance game of the physical chance game unit. Accordingly, various types of embodiments for the base game unit and the physical



chance game unit may be employed in order to correspond to these games of various types.

## CLAIMS

What is claimed is:

1. A game machine, comprising:
  - a physical chance game unit that performs a game of chance via predetermined chance game operation when a predetermined provision condition is satisfied; and
  - a physical chance game control device adapted and configured to control said physical chance game unit so that, when a predetermined shortening condition is satisfied, the time period required for said predetermined chance game operation is shortened, as compared to when said predetermined provision condition is satisfied.
  
2. A game machine according to Claim 1, wherein:
  - said predetermined chance game operation includes a plurality of processes;
  - when said predetermined shortening condition is satisfied, said physical chance game control device controls said physical chance game unit by changing the order in which processes are started so that the time period required for said predetermined chance game operation is shortened, as compared to when said predetermined provision condition is satisfied.
  
3. A game machine according to Claim 1, wherein
  - said predetermined chance game operation includes a plurality of processes;
  - said physical chance game control device controls said physical chance game unit by executing at least a part of said plurality of processes in parallel with one another so that the time period required for said predetermined chance game operation is shortened.
  
4. A game machine according to Claim 3, further comprising a plurality of base

game units that are arranged around said physical chance game unit, each of which supplies a base game, and wherein:

said physical chance game unit has a provision direction for providing the result of said chance game, and is configured to be rotatable so as to point said provision direction in the direction of any one of said base game units;

a condition relating to said base game is employed as said predetermined provision condition;

said predetermined chance game operation includes, if said predetermined provision condition is satisfied, starting in order, as said plurality of processes, at least a preparation process in which said physical chance game unit rotates so as to point said provision direction in the direction of the base unit that satisfies said predetermined provision condition, and an execution process of said physical chance game unit executing said chance game; and

said physical chance game control device executes said preparation process and said execution process in parallel with one another as the part.

5. A game machine according to any one of Claims 1 to 4, wherein:

said physical chance game unit comprises: a rotating body that is provided with a plurality of reception sections for receiving a chance gaming medium so that the plurality reception sections are arranged along its external periphery, and that moreover is disposed so as to be rotatable; and a medium guidance path having a tilt that guides said chance gaming medium to said reception sections, and is configured so as to execute said change game through receiving of said chance gaming medium to said reception sections; and

said rotating body is arranged so as to be inclined and so as to form a height difference between said reception sections,

the said medium guidance path is configured so that the tilt angle is adjustable.

6. A game machine according to Claim 5, wherein said physical chance game control device controls the tilt angle of said medium guidance path so that the time period required for said predetermined chance game operation is shortened, as compared to when said predetermined provision condition is satisfied.

7. A game machine according to Claim 5 or 6, wherein:

said physical chance game unit comprises a rotation braking device that decelerates and stops the rotation of said rotating body; and

said physical chance game control device controls said rotation braking device of said physical chance game unit so that, by deceleration of the rotation of said rotating body, the time period required for said predetermined chance game operation is shortened as compared to when said predetermined provision condition is satisfied.

8. A game machine according to any one of Claims 1 to 7, wherein:

said predetermined chance game operation includes two alternative processes that are executed as mutual alternatives when said predetermined provision condition is satisfied; and

said physical chance game control device controls said physical chance game unit so that, when said predetermined shortening condition is satisfied, both of said two alternative processes are included in said predetermined chance game operation.

9. A game machine according to any one of Claims 1 to 8, wherein:

said predetermined chance game operation includes an abnormal process that is not limited to being executed every time, even if said predetermined provision condition is satisfied; and

said physical chance game control device controls said physical chance game unit so that, when said predetermined shortening condition is satisfied, said abnormal

process is also included in said predetermined chance game operation.

10. A control method that is applied to a game machine comprising a physical chance game unit that performs a game of chance via a predetermined chance game operation when a predetermined provision condition is satisfied, and wherein

the control method comprises a physical chance game control step that controls said physical chance game unit so that, when a predetermined shortening condition is satisfied, the time period required for said predetermined chance game operation is shortened, as compared to when said predetermined provision condition is satisfied.

11. A computer program for a game machine comprising a physical chance game unit that performs a game of chance via a predetermined chance game operation when a predetermined provision condition is satisfied, and wherein

the computer program for the game machine is configured so as to cause a computer which is incorporated into the game machine to function as a physical chance game control device adapted and configured to control said physical chance game unit so that, when a predetermined shortening condition is satisfied, the time period required for said predetermined chance game operation is shortened, as compared to when said predetermined provision condition is satisfied.



Fig. 2

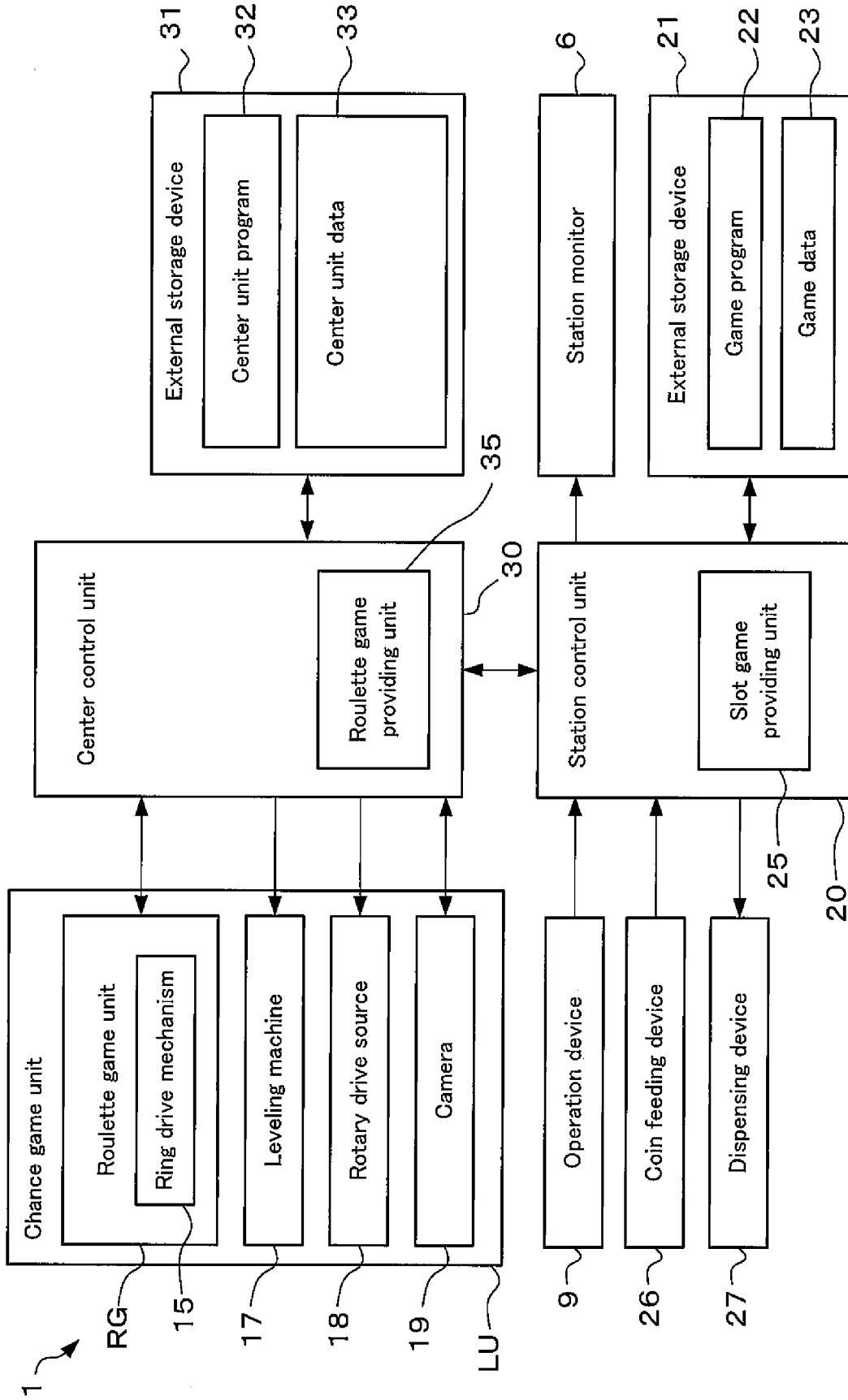


Fig. 3

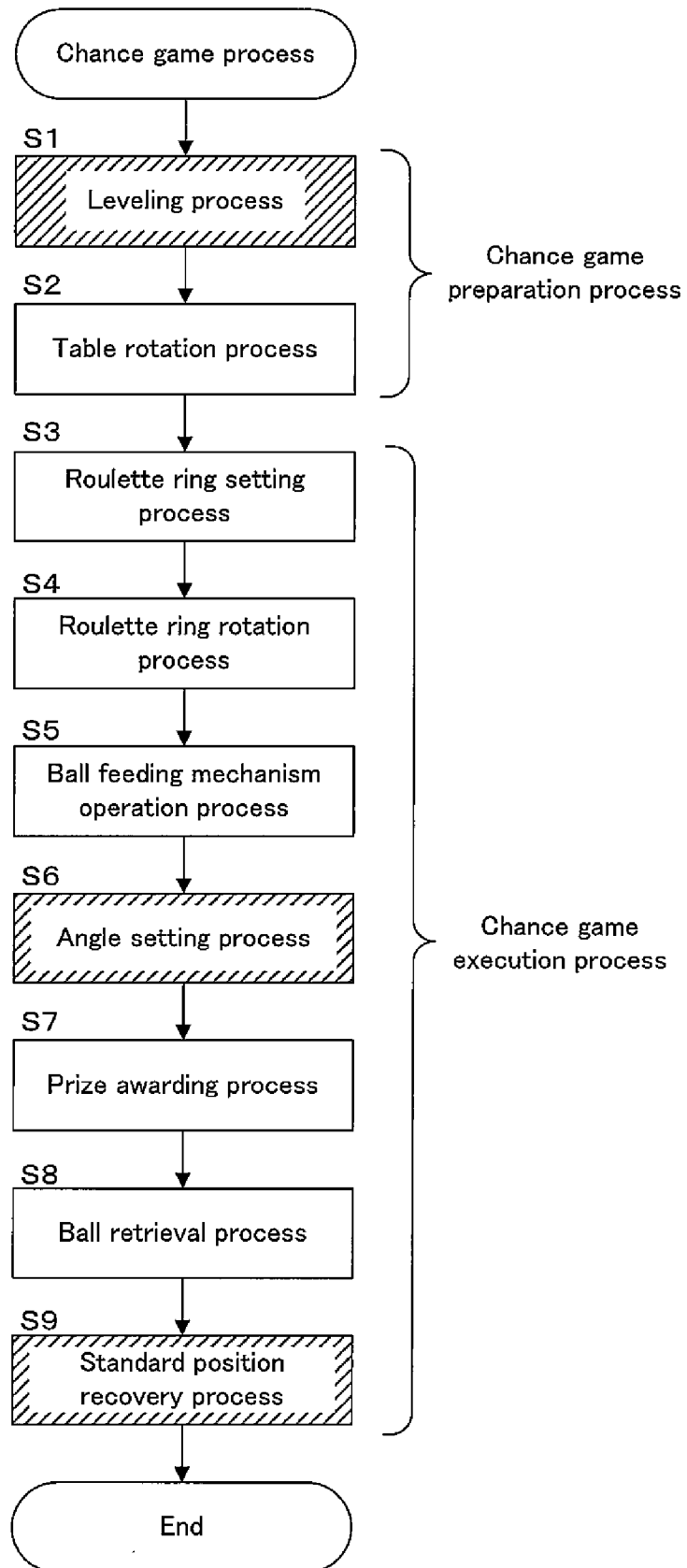




Fig. 4

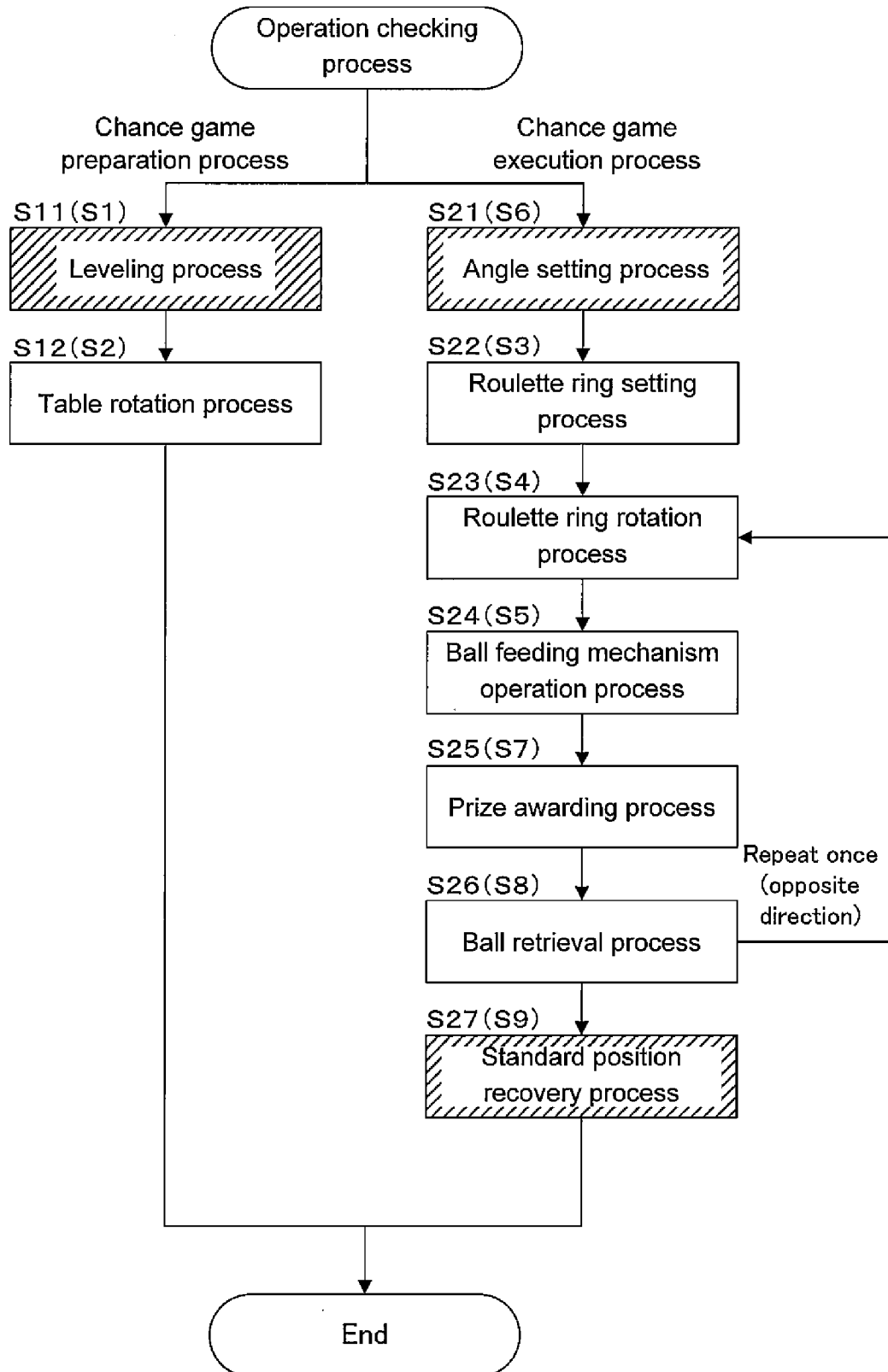


Fig. 5

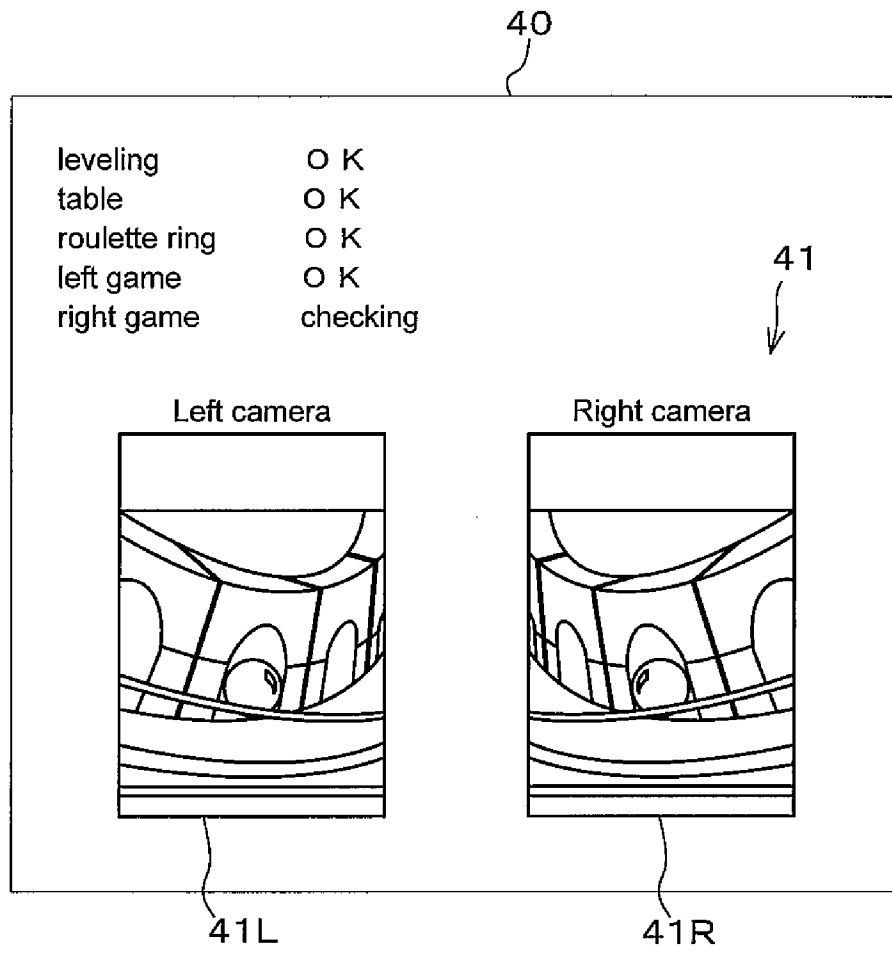


Fig. 6

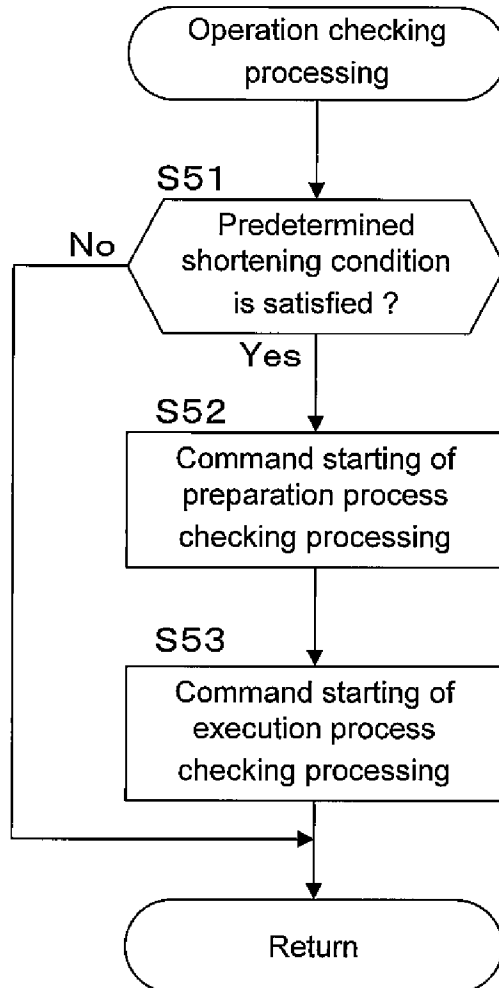


Fig. 7

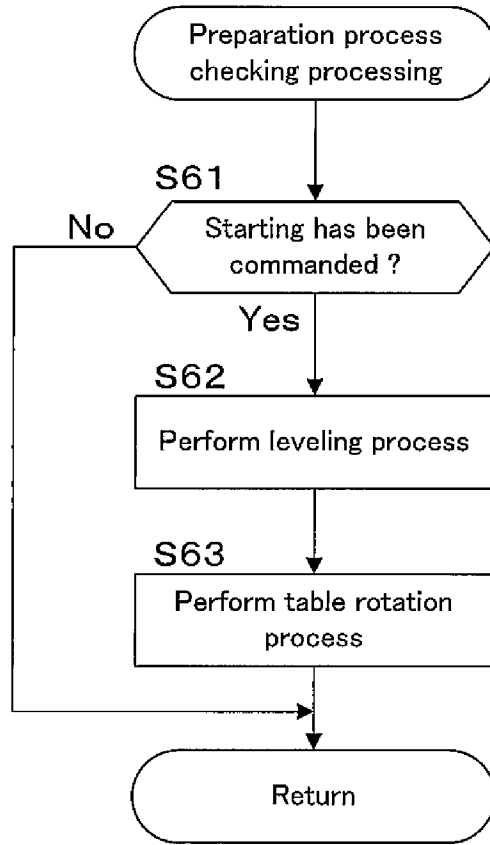


Fig. 8

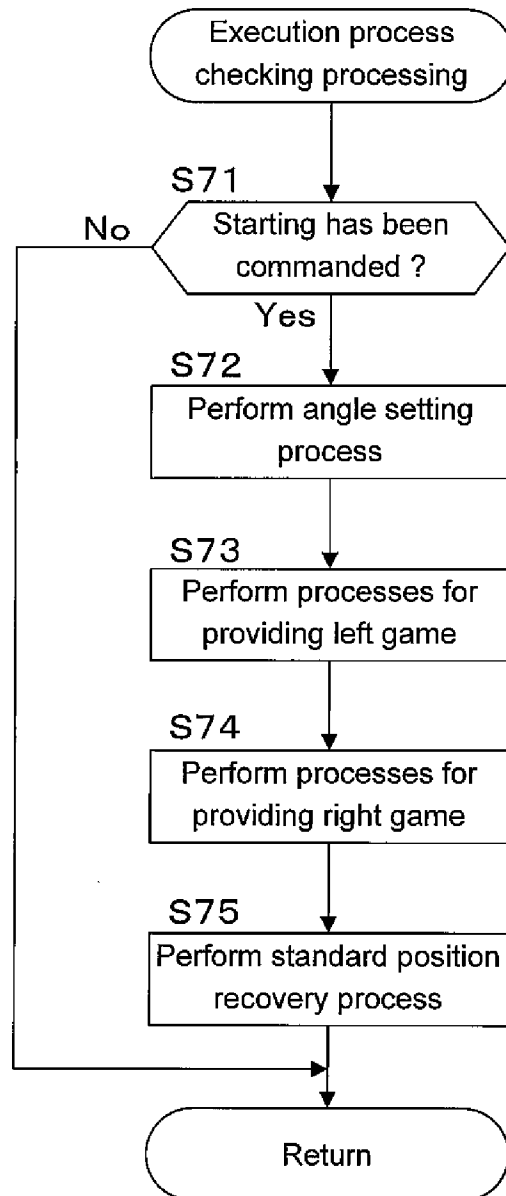
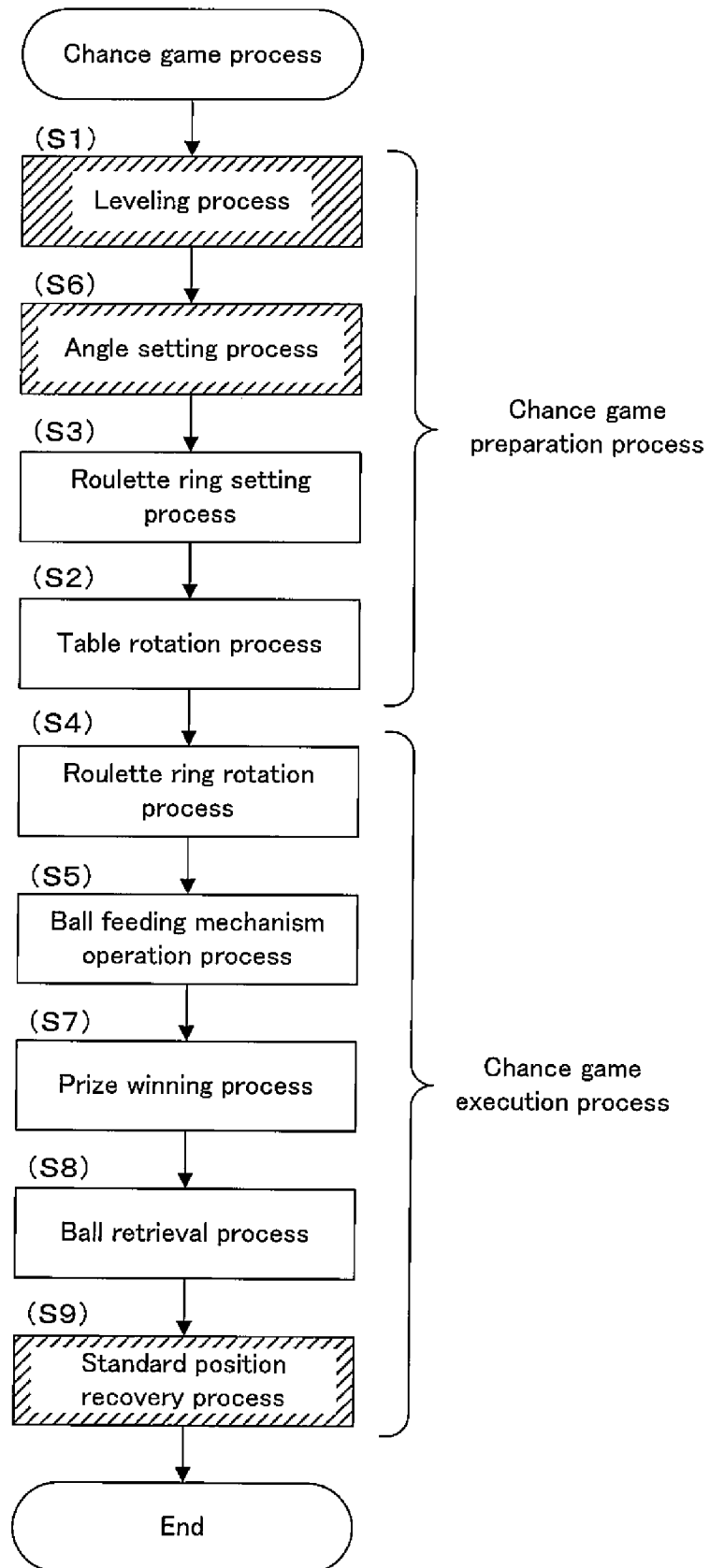


Fig. 9



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2013/045803

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(8) - A63F 9/24 (2013.01). USPC - 463/17 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC(8) - A63F 9/24, 13/00; G07F 17/32 (2013.01) USPC - 463/16, 17, 20, 25 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched CPC - G07F 17/32 (2013.01) Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PatBase, Google Patents, Google Scholar, YouTube		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/0004056 A1 (WALKER et al) 07 January 2010 (07.01.2010) entire document	1, 10-11
A	US 2006/0163806 A1 (TOYODA) 27 July 2006 (27.07.2006) entire document	1-6, 10-11
A	US 2006/0267274 A1 (CAMMEGH) 30 November 2006 (30.11.2006) entire document	1-6, 10-11
A	US 2009/0005147 A1 (OKUAKI et al) 01 January 2009 (01.01.2009) entire document	1-6, 10-11
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 20 November 2013		Date of mailing of the international search report <b>03 DEC 2013</b>
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2013/045803

**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.: 7-9  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.