

Control System for a Gaming Device

2193357

Technical Field

The present invention relates to gaming devices having one or more rotating symbol-bearing reels each of which is stopped to display a randomly selected symbol along a win line and more particularly to a control system including a reel mapping scheme for such a gaming device which allows one standard reel stop control software routine to control the stopping of the reels when the device is operated as a standard gaming device, a multiple stop gaming device, a virtual reel gaming device or variations thereof.

Background of the Invention

Gaming devices are known which include a number of rotating symbol-bearing reels each of which is individually stopped to display a randomly selected symbol along a win line. If the symbols displayed along the win line form a winning combination, a prize is paid out to the player.

Standard gaming devices of this type typically employ reels which have one stop position for each symbol on the reel, each stop position having one random number associated with it. To stop a reel in a standard gaming device, a random number is generated and the reel stopped at the stop position associated with the random number.

Multiple stop gaming devices are also known which employ reels having multiple stop positions for many of the symbols on the reel with the highest paying symbols having only one stop position. As in the standard gaming device, each stop position in a multiple stop gaming device has only one random number associated with it. To stop the reel in the multiple stop gaming device, a random number is generated and the reel stopped at the stop position associated with the random number.

as in the standard gaming device. However, the odds of winning by matching symbols having only one stop in a multiple stop game are less than those in a standard game so that larger prizes may be paid out to the player from a multiple stop gaming device than a standard device.

Virtual reel gaming devices are also known which employ reels typically having one stop position associated with each symbol on the display; however, a number of stop positions have multiple random numbers associated with them. As in the multiple stop gaming device, the odds of winning by matching symbols having only one associated random number in a virtual reel gaming device is less than the odds of winning in a standard gaming device so that larger prizes may be paid out to the player in a virtual reel gaming device than in a standard device.

To provide one game which may at different times or on different machines be played as a standard type game, multiple stop type game or virtual reel type game, gaming device manufacturers must develop different reel stop controls including different software routines for each game type. The software development for the different types of game is extremely costly.

Summary of the Invention

The invention provides a control system for a gaming device having at least one rotary symbol-bearing reel that has n stop positions associated with each symbol, where n is an integer greater than 1 and is the same from symbol to symbol, the control system comprising:

reel stop map means for storing, for each symbol on the reel, unique data for identifying the n stop positions associated with that symbol, the stop data being stored at addressable locations each having an associated unique address offset value k , with the stop data associated with the n stop positions for the same symbol being grouped at consecutive

addressable locations, having consecutive offset values k ;

symbol map means for storing, for each symbol location on the reel, data representing the symbol appearing on the reel at that location, the symbol location data being stored at consecutive addressable locations each having an associated unique address offset value $\text{INT}(\frac{k}{n})$ where k is one of the n reel map address offset values associated with that symbol's n stop positions and the function INT represents the integral part of the fraction $\frac{k}{n}$ without the remainder;

mapping index means for storing from 1 to n reel map address offset values k for each symbol on the reel, data representing the reel map address offset values k being stored at consecutive addressable locations each having an associated unique index offset value;

random number generating means for generating a random number representing an index offset value;

means for identifying, from the random numbers generated, the reel stop map address offset value k associated with each randomly generated index offset value and for obtaining from the reel stop map means the stop data stored at the addressable location having the offset value k ;

means for stopping the reel at the stop position so identified; and

means for obtaining, from the symbol ~~reel~~ map means, the symbol data stored at the addressable location having the offset value $\text{INT}(\frac{k}{n})$, thereby identifying the symbol on the reel at the randomly selected stop location.

The mapping index means allows one standard reel stop control software routine to control the stopping of the reels when the device is operated as a standard gaming device, a multiple stop gaming device, a virtual reel gaming device or variations thereof.

In order to stop a reel, the gaming device includes a random number generator for generating a random number representing an index offset value for the mapping index

memory. A reel stop control mechanism is provided to stop the reel at the stop position whose associated k offset value is the value stored in the mapping index at the address having the index offset value represented by the random number generated in order to display along the win line the symbol whose associated symbol address offset value is equal to $\frac{k}{n}$ without the remainder.

In order to operate the gaming device of the present invention as a standard gaming device, the mapping index for each reel stores a reel map offset value k at only one location in the index for each symbol on the reel such that one randomly generated number corresponds to each symbol on the reel, Only one of the n stops for each symbol can therefore be selected.

In order to operate the gaming device as a multiple stop gaming device, the mapping index for each reel stores two or more different reel map offset values k for at least one of the symbols on the reel such that more than one of the available n stops may be selected for that symbol or those symbols.

To provide a virtual reel gaming device, for each of a number of symbols on the reel the mapping index stores the same reel map offset value k at two or more different index addressable locations such that different randomly generated numbers point to the same stop position for a symbol on the reel.

Because the same reel stop control software routine is employed to control the stopping of the reels when the device is operated as a standard gaming device, a virtual reel gaming device or a multiple stop gaming device, the costs of manufacturing one game, which may be played as any one of the three game types, are substantially reduced. Indeed the control system may if desired comprise all three of the different mapping index means described above, together with

means for selecting between those mapping index means, whereby the control system enables the gaming device to be operated as a standard gaming device, a multiple stop gaming device or a virtual reel gaming device.

The invention also provides a control system for a gaming device having at least one rotary symbol-bearing reel that has n stop positions associated with each symbol, where n is an interger greater than 1 and is the same from symbol to symbol, the control system enabling the gaming device to operate as a standard gaming device, a multiple stop gaming device or a virtual reel gaming device as required and comprising:

reel stop map means for storing, for each symbol on the reel, unique data for identifying the n stop positions associated with that symbol, the stop data being stored at addressable locations each having an associated unique address offset value k, with the stop data associated with the n stop positions for the same symbol being grouped at consecutive addressable locations, having consecutive offset values k;

symbol map means for storing, for each symbol location on the reel, data representing the symbol appearing on the reel at that location, the symbol location data being stored at consecutive addressable locations each having an associated unique address offset value $\text{INT} \left(\frac{k}{n} \right)$ where k is one of the n reel map address offset values associated with that symbol's n stop positions and the function INT represents the integral part of the fraction $\frac{k}{n}$ without the remainder;

standard game mapping index means for storing only one reel map address offset value k for each symbol on the reel, data representing the reel map address offset values k being stored at consecutive addressable locations each having an associated unique index offset value;

multiple stop game mapping index means for storing two or more different reel map address offset values k for at least some of the symbols on the reel, data representing the reel map address offset values k being stored at consecutive addressable locations each having an associated unique index offset value;

virtual reel game mapping index means for storing a reel map address offset value k for each symbol on the reel, data representing the reel map address offset values k being stored at consecutive addressable locations each having an associated unique index offset value and data representing the same reel map address offset value k being stored at more than one such location;

means for selecting between the standard gaming mapping index means, the multiple stop game mapping index means and the virtual reel game mapping index means;

random number generating means for generating a random number representing an index offset value;

means for identifying, from the selected mapping index means and the random numbers generated, the reel stop map address offset value k associated with each randomly generated index offset value and for obtaining from the reel stop map means the stop data stored at the addressable location having the offset value k;

means for stopping the reel at the stop position so identified; and

means for obtaining, from the symbol map means, the symbol data stored at the addressable location having the offset value $\text{INT}(\frac{k}{n})$, thereby identifying the symbol on the reel at the randomly selected stop location.

~~means for selecting between those mapping index means, whereby the control system enables the gaming device to be operated as a standard gaming device, a multiple stop gaming device or a virtual reel gaming device.~~

Brief Description of the Drawings

FIG. 1 is a perspective view of a gaming device employing the control system of the present invention;

FIG. 2 is a block diagram of the gaming device of FIG. 1;

FIG. 3 is a flowchart illustrating the reel stop control software routine utilized in the present invention;

FIG. 4 is a memory map illustrating the reel stop map, mapping index, and symbol reel map utilized in the present invention for a standard game;

FIG. 5 is a memory map illustrating the reel stop map, mapping index and symbol reel map utilized in the present invention for a multiple stop game; and

FIG. 6 is a memory map illustrating a reel stop map, mapping index and symbol reel map utilized in the present invention for a virtual reel game.

Best Mode For Carrying Out The Invention

A gaming device 10 employing the reel mapping scheme of the present invention is shown in FIG. 1. The gaming device 10 includes three symbol bearing reels 12, 13 and 14 which are controlled to rotate in response to the pulling of a handle 16 after a coin is inserted into a coin input slot 18. The gaming device 10 includes a game control microprocessor 20, as shown in FIG. 2, which stops each of the reels 12-14 to display three randomly selected symbols along a win line. If the symbols displayed along the win line form a winning combination, the microprocessor 20 causes the coin hopper to payout, through a payout chute 22 a number of coins or tokens.

The game control microprocessor 20, shown in FIG. 2, is preferably a Motorola 68,000 processor. The processor 20 controls the operation of the gaming device 10 in accordance with software and data stored in an EPROM 24 and RAM 26. The EPROM 24 and RAM 26 are coupled to the processor 20 by an address bus 28 and a data bus 30. To ensure that no data stored in the RAM 26 is lost during a power failure, the RAM 26 is coupled to a battery backup circuit 32. The game control microprocessor 20 is also coupled to various input sensors and devices as well as

the coin hopper through an input/output board 34 which is coupled to the processor 20 through the address and data buses 28 and 30 and an address modifier line 36. In order to address the input/output board 34, the game control processor 20 must output the correct address modifiers for the input/output board on line 36 as well as the address for the input/output board on the address bus 28. The game control microprocessor 20 controls each of the reels 12-14 through a reel control mechanism 38 which is coupled to the data bus 30 to receive data therefrom. The reel control mechanism 38 may include a stepper motor or the like for each of the reels 12-14 to start and stop the rotation of the reels in accordance with the data on bus 30 from the game control microprocessor 20. The reel control mechanism is also coupled to the input/output board 34 which is responsive to the microprocessor 20 for selecting a particular one of the stepper motor controls to receive data from the bus 30.

More particularly, the microprocessor 20 controls the starting and stopping of each of the reels 12-14 according to a software routine illustrated in the flow-chart of FIG. 3 which employs one of the memory map configurations depicted in FIGS. 4-6 for a standard game, multiple stop game and a virtual reel game respectively. To operate as any one of the three game types, standard, multiple stop or virtual reel, each of the reels 12-14 of the gaming device 10 has n stop positions for each symbol depicted on the reel. When the microprocessor 20 stops a reel at a particular stop position, the symbol associated with that stop position is displayed along a win line. Although n is set equal to 2 in the memory maps of FIGS. 4-6 so that there are two stop positions for every symbol on a reel, n may be any integer value.

Each of the memory configurations of FIGS. 4-6 has an associated reel stop memory map, a symbol reel

memory map and a mapping index. The reel stop memory map and symbol stop memory map are the same for each of the configurations; however, the mapping index for each configuration varies. Although three different mapping indexes must be stored for each reel in the EPROM 24 for one gaming device 10 which is capable of operating as all three game types, only one reel stop map and symbol reel map are needed and stored in the EPROM for each reel.

Each of the symbol reel memory maps 40 stores data representing each symbol on a reel at a location in the map corresponding to the location of the symbol on the reel to provide a map of the symbols on the reel. For a reel having $P+1$ symbols, the symbol reel memory map has $P+1$ data storage locations labeled SYMBOL 0 - SYMBOL P. The storage location labeled SYMBOL 0 stores data representing a first symbol on the reel, the storage location labeled SYMBOL 1 storing data representing a second symbol on the reel where the second symbol is located on the reel adjacent to the first symbol and so on such that the storage location labeled SYMBOL P stores data representing the $P+1$ symbol on the reel which symbol is located on the reel between the P symbol (whose data is stored at location SYMBOL P-1) and the first symbol (whose data is stored at location SYMBOL 0).

Each of the storage locations SYMBOL 0 - SYMBOL P in the symbol reel memory map 40 has an associated symbol address offset 42 ranging from 0-P. The address of the storage location SYMBOL 0 in map 40 for the first symbol is taken as a reference from which the addresses of each of the other storage locations in the map are offset, the symbol address offset for the location SYMBOL 0 being zero. The symbol address offsets vary by a unit value so that the symbol address offset for storage location SYMBOL 1 is 1, the offset for the storage location SYMBOL 2 being 2

and so on such that the offset for the storage location SYMBOL P is P.

Each of the reel stop memory maps 44 stores data representing each stop position on a given reel at a location in the map corresponding to the location of the stop on the reel to provide a map of the stops on the reel. For a reel having $P+1$ symbols, the reel stop map has $n(P+1)$ data storage locations. As shown in FIGS. 4-6, for a reel having two stop positions for each symbol, there are $2(P+1)$ data storage locations labeled STOP 0 - STOP P'. The storage location labeled STOP 0 stores data representing the first stop for the first symbol whose data is stored in the symbol reel map 40 at the storage location SYMBOL 0. The storage location labeled STOP 0' in map 44 stores data representing the second stop for the first symbol whose data is stored in the symbol reel map 40 at location SYMBOL 0. Similarly, the storage locations STOP 1 and STOP 1' in the reel stop map 44 store data respectively representing the first and second stops of the second symbol whose data is stored in the symbol reel map 40 in the storage location SYMBOL 1. In general, the storage locations STOP X and STOP X' in the reel stop map 44 store data respectively representing the first and second stop positions for the symbol whose data is stored in the symbol reel map 40 in the storage location SYMBOL X.

Each of the storage locations STOP 0 - STOP P' in the reel stop memory map 44 has an associated address offset value k 45 ranging from 0 to $2(P+1)$. The address for the storage location STOP 0 for the first stop for the first symbol on the reel is taken as a reference address from which the addresses of each of the other storage locations in the map 44 is offset so that the address offset k for the storage location STOP 0 is equal to 0. The k address offset values vary by a unit value so that the k address offset value for STOP 0' is 1, the k address

offset value for STOP 1 being 2 and so on such that the k address offset value for STOP P' is equal to $(P+1)$.

The offset values k for the reel stop memory map 44 are related to the symbol address offset values 42 such that the symbol address offset value 42 for a symbol

is equal to $\frac{k}{n}$, without the remainder, where k is one of the n reel map offset values associated with the symbol's n stops. For example, data for the third symbol on the reel is stored at storage location SYMBOL 2 in map 40

which has a symbol address offset of 2. The data for the first and second stops associated with the third symbol are stored at locations STOP 2 and STOP 2' having respectively associated k offset values of 4 and 5. For k=4,

the offset for the third symbol's first stop, $\frac{k}{n}$, is equal to $\frac{4}{2} = 2$ which is the symbol address offset for the third symbol whose data is stored at location SYMBOL 2 in the map 40. Similarly, for k=5, the offset for the third symbol's second stop, $\frac{k}{n}$, is equal to $\frac{5}{2} = 2$ with the remainder dropped which again is the symbol address offset for the third symbol in the map 40.

The mapping index for each of the memory configurations illustrated in FIGS. 4-6 stores one or more k offset values for each symbol on a reel where each k offset value stored in the mapping index points to symbol data in the symbol reel map whose associated symbol address

offset equals $\frac{k}{n}$ without the remainder. Each k offset value is stored in the mapping index at a location having an associated index offset value. To stop a reel to display a randomly selected symbol, the microprocessor 20, as discussed in detail below, generates a random number which represents an index offset associated with a particular storage location in the mapping index and the k offset value stored therein. The k offset value associated with

the generated random number/index offset in the mapping index points to a particular stop in the reel stop map 44 and to a particular symbol in the symbol reel map 40 such that the stop pointed to is a stop associated with the symbol pointed to.

In the mapping index 48 for a standard game as illustrated in FIG. 4, the mapping index stores a k offset value at only one location in the index for each symbol on the reel such that one unique index offset value points to only one of the n stops for each symbol on a reel. More particularly, the mapping index 48 for a standard game stores even k offset values 0 through 2P. The first storage location in the index 48 storing the k offset, 0, has an associated index offset 54 having a value of 0. The second storage location in the mapping index 48 stores a k offset value of 2 having an associated index offset value of 1 and so on such that the k offset value, 2P stored in the P+1 storage location in the mapping index 48 has an associated index offset of P. As seen in FIG. 4, each k offset value stored in the mapping index 48 points only to the first stop associated with each symbol on the reel.

The mapping index 50 for a multiple stop game as shown in FIG. 5 stores two or more different k offset values for a number of symbols on the reel such that more than one of the n stops is used for those symbols. As shown in the mapping index 50, the k offset values 0-3 are stored in the first four storage locations so that for the first two symbols whose data is stored respectively in the map 40 at locations SYMBOL 0 and SYMBOL 1, there are two possible stop positions associated with each symbol. Stop positions 1 and 2 whose data is stored in the locations STOP 0 and STOP 0' of the map 44 are the stop positions associated with the symbol whose data is stored in the location SYMBOL 0. The first and second stops whose stop

position data is respectively stored at locations STOP 1 and STOP 1' in map 44 are associated with the second symbol whose data is stored at location SYMBOL 1 in map 40. The third symbol on the reel whose data is stored in the map 40 at storage location SYMBOL 2, has only one stop associated therewith whose data is stored at the storage location in map 44 at STOP 2 having an associated k offset value of 4. Because only one of the two stops may be used for the symbol whose data is stored in map 40 at SYMBOL 2, the k offset value of 5 is not stored in the mapping index 50.

The mapping index 52 for a virtual reel game as shown in FIG. 6 stores for each of a number of symbols on the reel the same k offset value at different locations in the index such that multiple random numbers each associated with a different storage location in the index are generated to point to the same stop for a symbol on the reel. For example, the k offset value 2 is stored in the storage location 74 of the mapping index 52 and is also stored in the fourth storage location 76 in the index 52. Each of the k offset values 2 stored at the storage locations 74 and 76 in the map 52 points to the first stop whose stop position data is stored in map 44 at storage location STOP 1 for the second symbol on the reel whose data is stored in map 40 at the storage location SYMBOL 1. Although only even numbers are randomly stored in the mapping index 52 for the virtual reel game 56 so that only one stop for each symbol on the reel is employed, a virtual reel mapping index pointing to multiple stops could also be employed by combining the teachings of the mapping index illustrated in FIGS. 5 and 6.

At the start of a reel stopping operation for a standard game as shown with reference to FIGS. 3 and 4, the microprocessor 20, at a block 56, sets the reel number X equal to 1 to stop the first reel, reel 12, at a stop position to display a randomly selected number. The

microprocessor next, at block 58, generates a random number for reel 12 which represents an index offset value for the mapping index 48. At block 60, the microprocessor 20 fetches from reel 12's standard game mapping index the k offset value associated with the random number generated at block 58. For example, if the random number generated at block 58 for reel 12 is equal to 3, at block 60 the microprocessor fetches the k offset value 6 from the mapping index 48. The microprocessor then determines, at block 62, the value of $\frac{k}{2}$ without the remainder. In the example where the random number 3 is generated at block 58 so that the k offset value equals 6, $\frac{k}{2} = \frac{6}{2} = 3$. At block 64, the microprocessor 20 fetches from reel 12's symbol reel map 40 the symbol data associated with the offset $\frac{k}{2}$ dropping the remainder. In the example above where the symbol address offset equals $\frac{6}{2} = 3$, the data stored in the storage location SYMBOL 3 in the map 40 is fetched. Then at block 66, the microprocessor 20 fetches from reel 12's reel stop map 44 the stop data associated with the k offset value determined at block 60. In the above example, the k offset value is equal to 6 so that the data stored at the storage location STOP 3 in the map 44 is fetched at block 66. At block 68, the microprocessor 20 through the reel control mechanism 38 stops the reel 12 at the first stop whose data is stored at STOP 3 in map 44 for the fourth symbol whose data is stored in the map 40 at location SYMBOL 3. At block 69, the processor 20 determines whether each of the three reels have been stopped such that $X=3$ and if so, the microprocessor 20 exits the subroutine at block 70. If not, at block 71, X is set equal to $X+1$ and the processor returns to block 58 to stop the next reel.

For the multiple stop game mapping index 50 shown in FIG. 5, even and odd numbers are stored therein such that two k offset values are stored in the mapping index 50 for a number of symbols so that more than one of the two available stops is used for those symbols. If the random number 3 is generated at block 58 shown in FIG. 3 for a gaming device 10 having the memory map configuration of FIG. 5, at block 60, the microprocessor 20 fetches from the reel's mapping index 50 the k offset value 3 associated with the index offset value 3 represented by the random number. At block 62, the microprocessor determines that

the value of $\frac{k}{2}$ dropping the remainder is equal to $\frac{3}{2}$ without the remainder or 1 to point to the symbol data in map 40 whose associated offset is 1. At block 64, the microprocessor then fetches from the reel's symbol reel map 40 shown in FIG. 5 the data stored at the storage location SYMBOL 1 having the associated offset value of 1. Then at block 66, the microprocessor 20 fetches from the reel stop map 44, the stop data associated with the k offset value 3 whose data is stored at location STOP 1'. The microprocessor 68 through the reel control mechanism 38 then stops the reel at the second stop identified by the data stored in the map 44 at STOP 1' for the second symbol on the reel whose data is stored in the storage location SYMBOL 1 of map 40.

As shown in FIG. 3 for a virtual reel game, the microprocessor 20 again generates a random number for a given reel at block 58, which random number in the above examples has been 3. At block 60, the processor 20 fetches from the reel's virtual reel mapping index 52, the k offset value 2 stored at the storage location 56 whose associated index offset or random number is equal to 3.

At block 62, the value of $\frac{k}{2}$ without the remainder is determined to be $\frac{2}{2} = 1$ so that at block 64, the processor 20

fetches from the symbol reel map 40 shown in FIG. 6 the symbol data stored in map 40 in the storage location SYMBOL 1 for the second symbol on the reel. At block 66, the processor 20 then fetches from the reel stop map 44 the stop data stored at the storage location STOP 1 whose associated k offset value is equal to 2. At block 68, the processor 20 stops the reel at the first stop for the second symbol whose stop position data is stored in the location STOP 1 of map 44 and whose symbol data is stored at the location SYMBOL 1 of map 40.

As can be seen from the above descriptions of FIGS. 3-6, the same random number will stop a reel at various stop positions on the reel to display different symbols along the even line depending on the type of memory configuration employed.



CLAIMS:

1. A control system for a gaming device having at least one rotary symbol-bearing reel that has n stop positions associated with each symbol, where n is an integer greater than 1 and is the same from symbol to symbol, the control system comprising:

reel stop map means for storing, for each symbol on the reel, unique data for identifying the n stop positions associated with that symbol, the stop data being stored at addressable locations each having an associated unique address offset value k, with the stop data associated with the n stop positions for the same symbol being grouped at consecutive addressable locations, having consecutive offset values k;

symbol map means for storing, for each symbol location on the reel, data representing the symbol appearing on the reel at that location, the symbol location data being stored at consecutive addressable locations each having an associated unique address offset value $\text{INT} \left(\frac{k}{n} \right)$ where k is one of the n reel map address offset values associated with that symbol's n stop positions and the function INT represents the integral part of the fraction $\frac{k}{n}$ without the remainder;

mapping index means for storing from 1 to n reel map address offset values k for each symbol on the reel, data representing the reel map address offset values k being stored at consecutive addressable locations each having an associated unique index offset value;

random number generating means for generating a random number representing an index offset value;

means for identifying, from the random numbers generated, the reel stop map address offset value k associated with each randomly generated index offset value and for obtaining from the reel stop map means the stop data stored at the addressable location having the offset value k;

means for stopping the reel at the stop position so identified; and

means for obtaining, from the symbol ~~map~~ map means, the symbol data stored at the addressable location having the offset value $\text{INT} \left(\frac{k}{n} \right)$ thereby identifying the symbol on the



reel at the randomly selected stop location.

2. A control system according to claim 1 for operating the gaming device as a standard gaming device, wherein the mapping index stores only one reel map offset value k for each symbol on the reel, so that only one randomly generated index offset value corresponds to each symbol on the reel.

3. A control system according to claim 1 for operating the gaming device as a multiple stop gaming device, wherein the mapping index stores two or more different reel map offset values k for at least some of the symbols on the reel, so that the reel can be stopped at two or more of the n possible stop positions for each of those symbols.

4. A control system according to claim 1 for operating the gaming device as a virtual reel gaming device, wherein the mapping index stores the same reel map offset value k at two or more different index addressable locations, so that two or more different randomly generated index offset values point to the same stop position of the reel.

5. A control system for a gaming device having at least one rotary symbol-bearing reel that has n stop positions associated with each symbol, where n is an integer greater than 1 and is the same from symbol to symbol, the control system enabling the gaming device to operate as a standard gaming device, a multiple stop gaming device or a virtual reel gaming device as required and comprising:

reel stop map means for storing, for each symbol on the reel, unique data for identifying the n stop positions associated with that symbol, the stop data being stored at addressable locations each having an associated unique address offset value k, with the stop data associated with the n stop positions for the same symbol being grouped at consecutive addressable locations, having consecutive offset values k;



symbol map means for storing, for each symbol location on the reel, data representing the symbol appearing on the reel at that location, the symbol location data being stored at consecutive addressable locations each having an associated unique address offset value $\text{INT} \left(\frac{k}{n} \right)$ where k is one of the n reel map address offset values associated with that symbol's n stop positions and the function INT represents the integral part of the fraction $\frac{k}{n}$ without the remainder;

standard game mapping index means for storing only one reel map address offset value k for each symbol on the reel, data representing the reel map address offset values k being stored at consecutive addressable locations each having an associated unique index offset value;

multiple stop game mapping index means for storing two or more different reel map address offset values k for at least some of the symbols on the reel, data representing the reel map address offset values k being stored at consecutive addressable locations each having an associated unique index offset value;

virtual reel game mapping index means for storing a reel map address offset value k for each symbol on the reel, data representing the reel map address offset values k being stored at consecutive addressable locations each having an associated unique index offset value and data representing the same reel map address offset value k being stored at more than one such location;

means for selecting between the standard gaming mapping index means, the multiple stop game mapping index means and the virtual reel game mapping index means;

random number generating means for generating a random number representing an index offset value;

means for identifying, from the selected mapping index means and the random numbers generated, the reel stop map address offset value k associated with each randomly generated index offset value and for obtaining from the reel stop map means the stop data stored at the addressable location having the offset value k ;



means for stopping the reel at the stop position so identified; and

means for obtaining, from the symbol ~~map~~ map means, the symbol data stored at the addressable location having the offset value $\text{INT}(\frac{k}{n})$, thereby identifying the symbol on the reel at the randomly selected stop location.

6. A control system for a gaming device, substantially as described herein with reference to the drawings.
