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(54) **ROTATABLE VIDEO DISPLAY AND DISPLAY METHOD FOR A GAMING MACHINE**

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(57) **ABSTRACT**

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An apparatus includes a support structure mounted for rotation within a gaming machine cabinet. A display device is mounted on the support structure. The support structure may, for example, comprise a support structure for a reel of a reel-type gaming machine, and the display device may be mounted so that the device makes up at least a portion of the reel peripheral curved surface. In this position, the video display may display one or more of the reel symbols for the reel. A processing device is mounted in the gaming machine cabinet separate from the support structure, so that the processing device does not rotate with the support structure as the support structure rotates in the gaming machine cabinet. A communication path is provided between the processing device and the display device so that data and/or control instructions, that is, display operation information, may be communicated for use in controlling the operation of the display device. A wireless communication link is included in the communication path between the processing device and the display device.

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(21) **Appl. No.: 11/361,066**

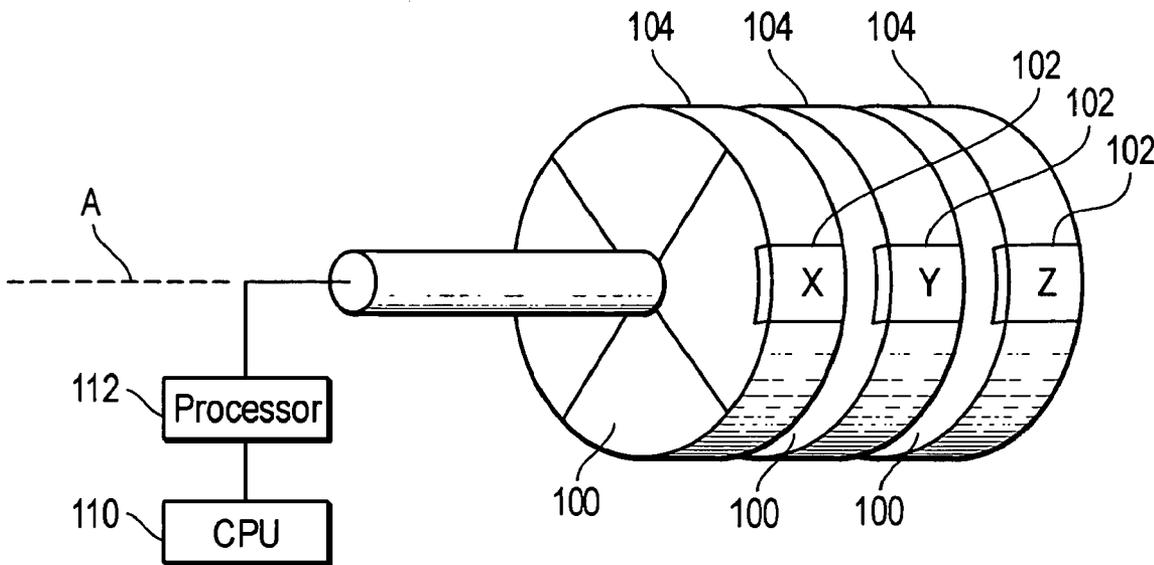
(22) **Filed: Feb. 23, 2006**

**Related U.S. Application Data**

(63) **Continuation-in-part of application No. 10/985,362, filed on Nov. 10, 2004.**

**Publication Classification**

(51) **Int. Cl.**  
**A63F 9/24 (2006.01)**



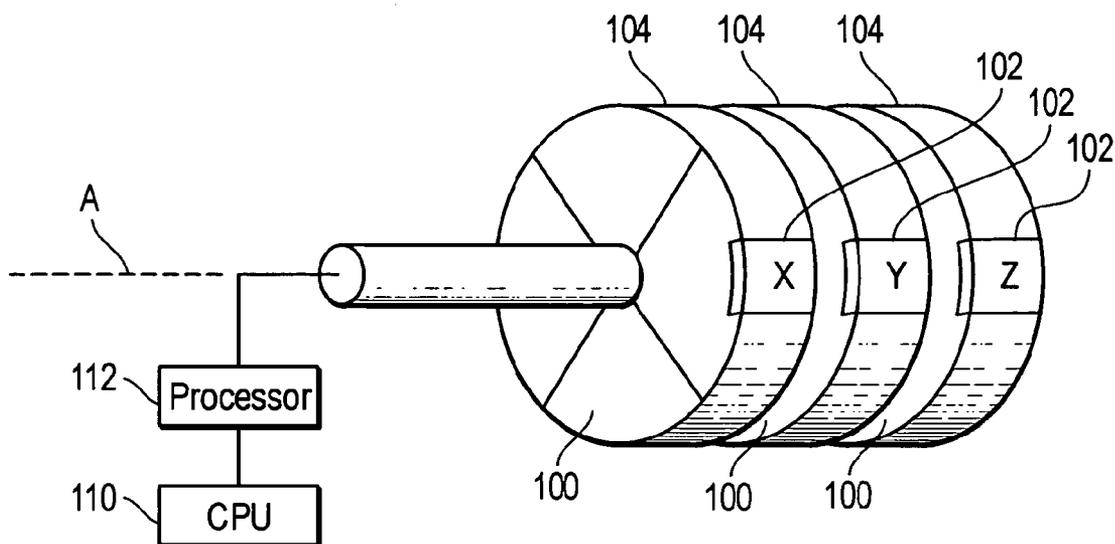


FIG. 1

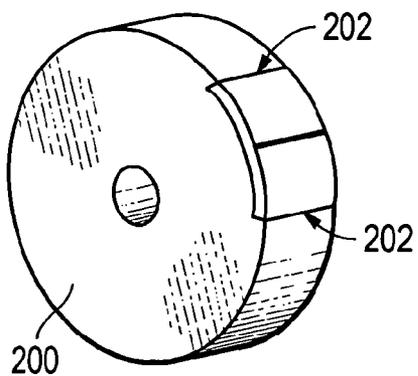


FIG. 2

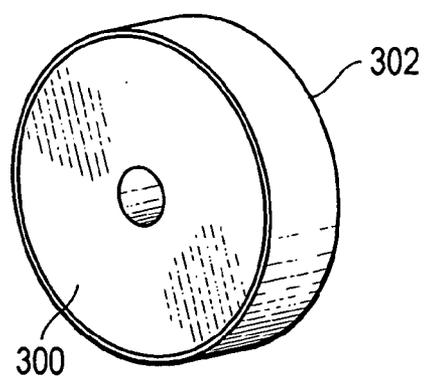


FIG. 3

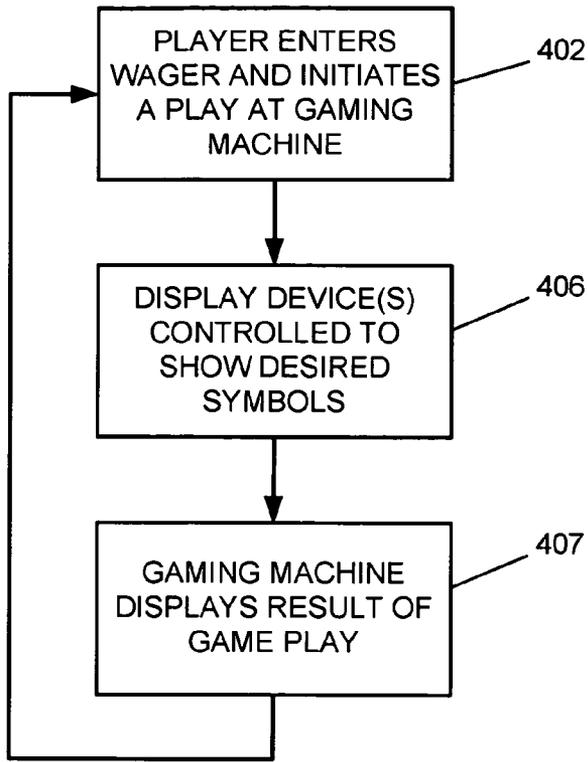


FIG. 4

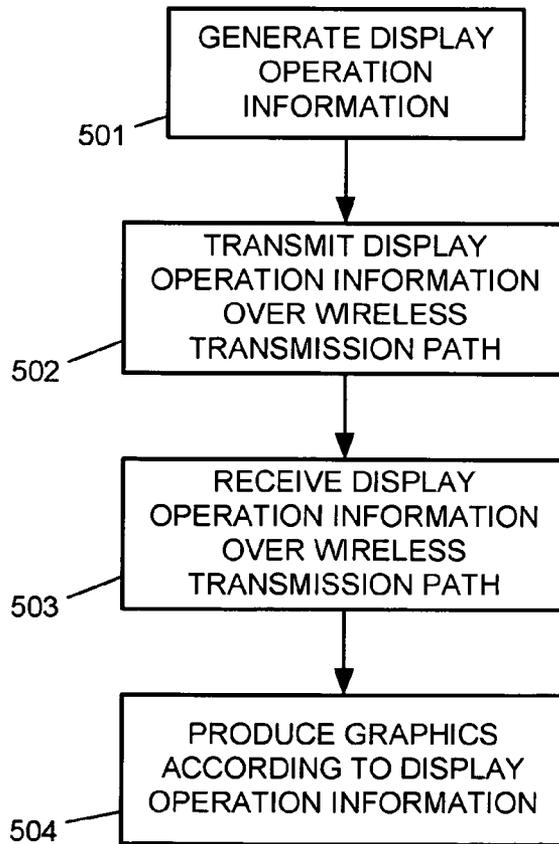
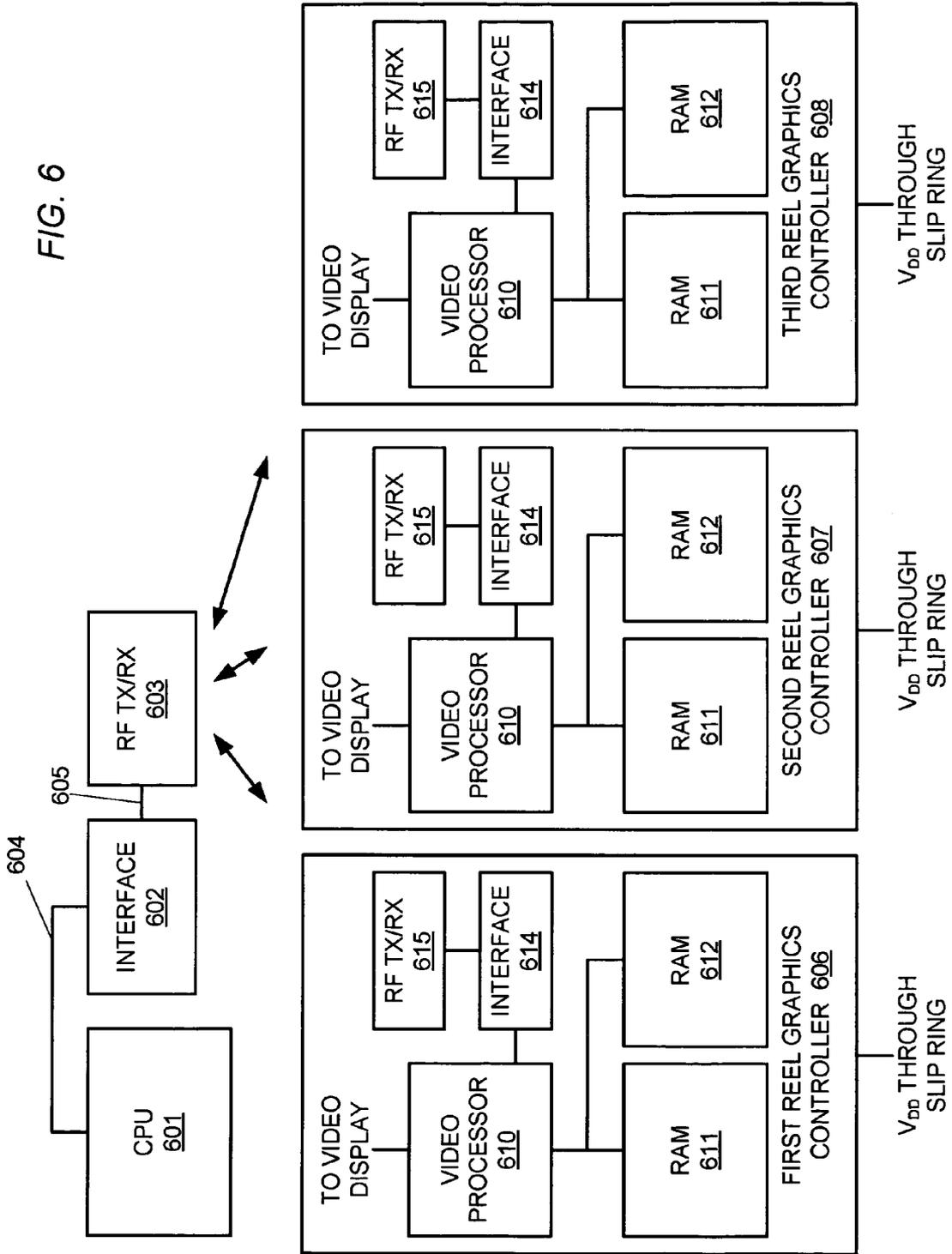


FIG. 5

FIG. 6



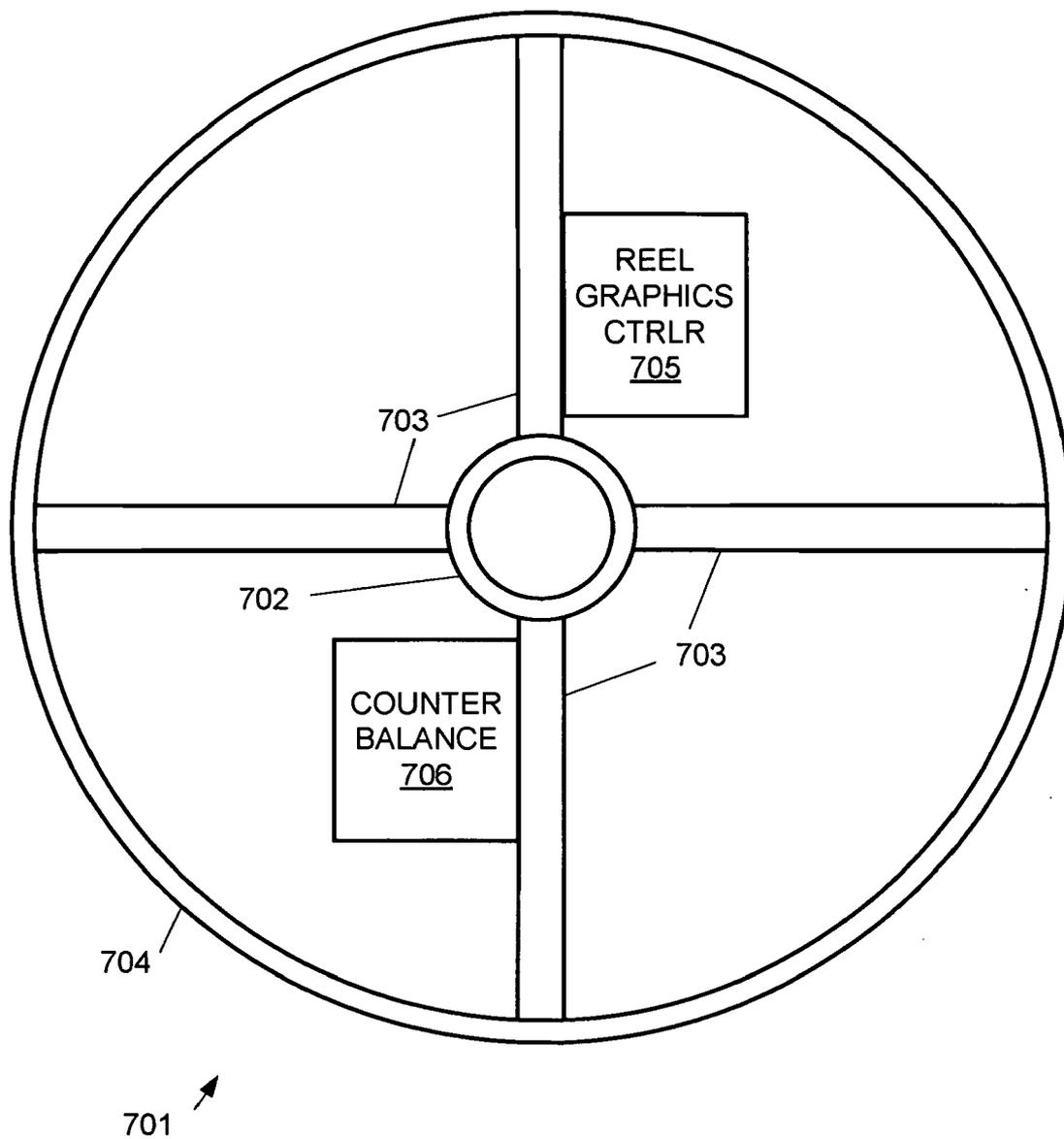


FIG. 7

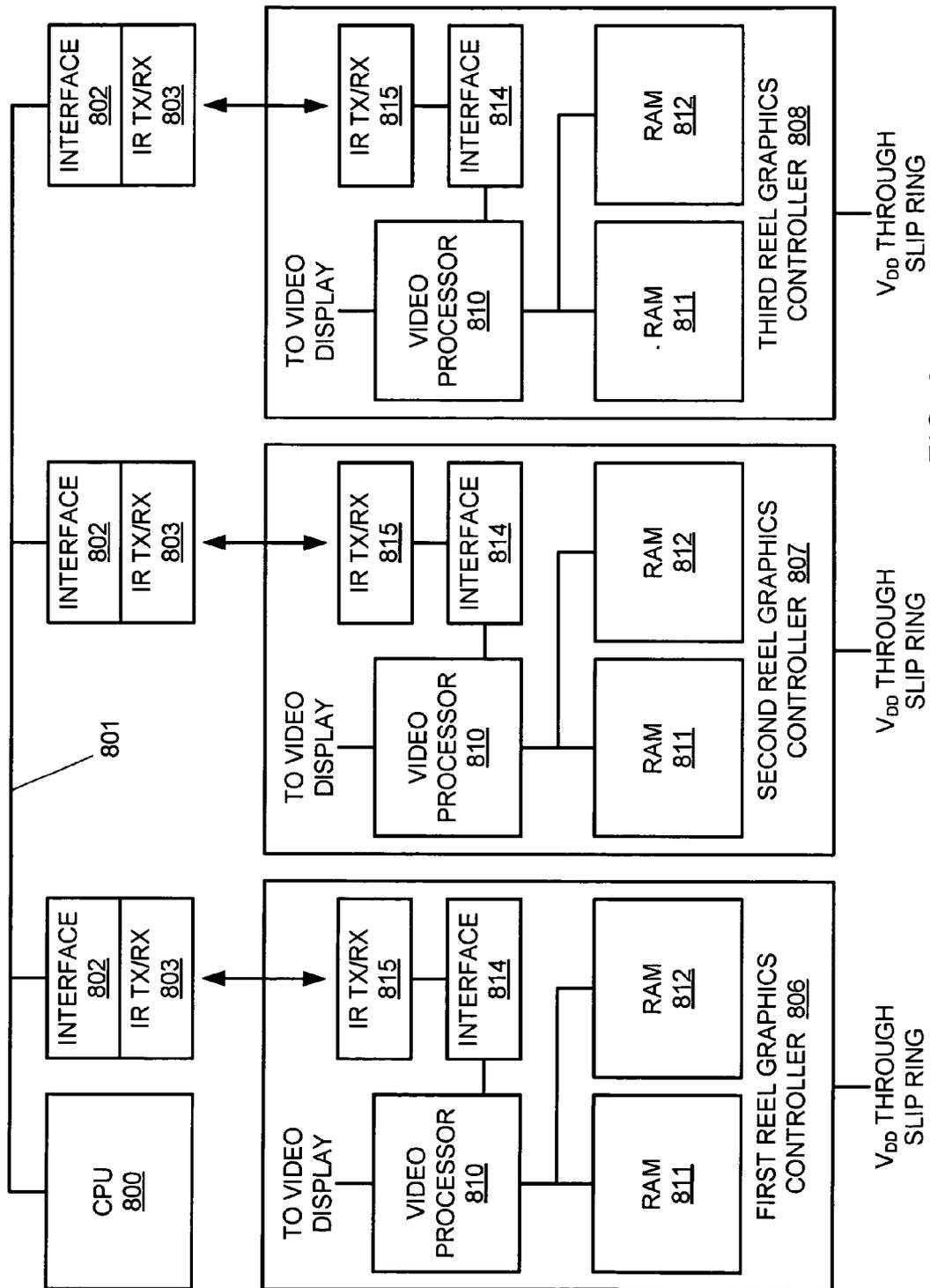


FIG. 8

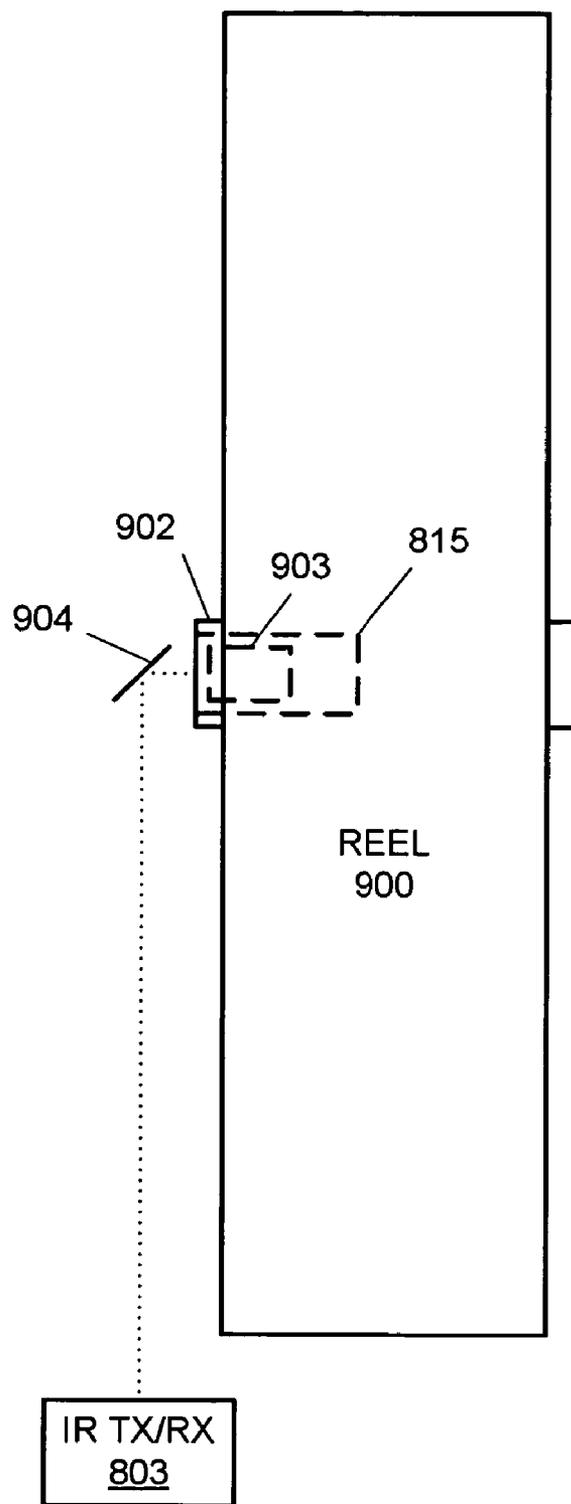


FIG. 9

## ROTATABLE VIDEO DISPLAY AND DISPLAY METHOD FOR A GAMING MACHINE

### CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 10/985,362, filed Nov. 10, 2004, and entitled "Curved Surface Display for a Gaming Machine." This application is also related to PCT International Application PCT/US05/40770, filed Nov. 10, 2005, of the same title. The inventor claims priority from both of these prior applications under 35 U.S.C. §120. The entire content of each of these applications is incorporated herein by this reference.

### TECHNICAL FIELD OF THE INVENTION

[0002] This invention relates to gaming machine displays. More particularly, the invention is directed to apparatus and methods for games in which a player may view images being displayed on a rotatable structure such as, for example, a rotatable reel in a reel-type gaming machine.

### BACKGROUND OF THE INVENTION

[0003] Traditional mechanical slot machines include three or more reels rotatably mounted on a common axis. Each reel has a number of symbols spaced apart around its periphery. The symbols may be pictures of bells, bars, fruit, or any number of other symbols to suit a particular theme for the slot machine. When the reels are at rest, they define a matrix of reel symbol locations. For example, a traditional three-reel, reel-type gaming machine may display a three-by-three matrix of symbol locations when the three reels are at rest, each reel showing a column of three symbols each. Mechanical reel gaming machines may also include a separate reel for each symbol location. For example, a common reel arrangement includes nine separate reels, one reel for each symbol location in a three-by-three matrix of symbol locations with each reel oriented to rotate about an axis lying in a plane in common with the axis of each other reel.

[0004] Regardless of how the matrix of symbol locations is produced in a mechanical reel gaming machine, one or more lines of symbol locations are defined through the matrix of symbol locations. These lines of symbol locations are commonly referred to as "paylines." For example, a payline in the three-reel gaming machine mentioned above may have five different paylines, one line for each horizontal row of symbol locations in the three-by-three matrix of symbol locations, and one line for each diagonal through the symbol locations. In the play of one of these reel-type gaming machines, a player makes a wager for a given payline, and then pulls a handle or actuates some other control on the gaming machine to cause the reels to rotate. The reel symbols that line up along the respective payline when the reels stop rotating represent a result for that payline. Typically, a number of combinations of symbols along a payline are defined as winning combinations, and any other combination of symbols along a payline represents a losing combination. Each gaming machine usually provides a pay table that illustrates the various winning combinations of reel symbols and indicates the prize associated with each winning combination.

[0005] Early mechanical reel gaming machines relied on the randomness resulting from rotating and then stopping the

reels to determine the results for a given play at the gaming machine. In more recent mechanical reel gaming machines, a result for a given play of the game is generated by a random result generator associated with the gaming machine and each reel may be forced to stop rotating at the appropriate position to show the proper set of reel symbols along the payline for that result. A result for a given play in a mechanical reel gaming machine may also be identified from a lottery record selected at the gaming machine or at another device in communication with the gaming machine, and the reels may be caused to stop so as to show reel symbols along a given payline that are consistent with the lottery result. A result to be displayed in a mechanical reel-type gaming machine may also be obtained from a bingo game, or from some other result generating arrangement.

[0006] The reels in a typical mechanical reel gaming machine are located in a cabinet behind a glass plate with the reel symbols on the periphery of the reels facing the player position in front of the gaming machine. The glass plate defines one or more windows through which the various reel symbol positions are visible to the player. The mechanical structure that allows the reels to rotate and the control structure for driving and stopping the reels are usually hidden within the gaming machine cabinet.

[0007] Mechanical reel gaming machines present a number of problems. For example, a mechanical reel gaming machine is prone to break down due to the mechanical nature of the device. In addition, mechanical reel-type machines do not offer an easy way to change the appearance of the gaming machine. For these reasons and others, gaming machine manufacturers have developed video reel-type gaming machines in which a video display device such as a CRT device is operated to display a representation of rotating reels. These electronic versions of reel-type gaming machines offer flexibility in modifying reel indicia and reduce the number of mechanical components in the mechanical reel-type gaming machines. However, among other problems, prior video gaming machines that imitate mechanical reel-type gaming machines may not look realistic depending upon the quality of the video display and the graphics processing arrangement associated with the gaming machine.

### SUMMARY OF THE INVENTION

[0008] The present invention provides apparatus and methods for displaying results in a gaming machine in which at least a portion of a result is shown with a device that rotates with respect to the gaming machine cabinet, such as a reel in a reel-type gaming machine, for example. In particular, the present invention provides apparatus and methods for producing realistic mechanical reel presentations while achieving the flexibility of video reel-type presentations.

[0009] One preferred apparatus embodying principles of the invention includes a support structure mounted for rotation within a gaming machine cabinet. A display device is mounted on the support structure. The support structure may, for example, comprise a support structure for a reel of a reel-type gaming machine, and the display device may be mounted so that the device makes up at least a portion of the reel peripheral surface. In this position, the video display

may display one or more of the reel symbols for the reel. A processing device is mounted in the gaming machine cabinet separate from the support structure, so that the processing device does not rotate with the support structure as the support structure rotates in the gaming machine cabinet. A communication path is provided between the processing device and the display device so that data and/or control instructions, that is, display operation information, may be communicated for use in controlling the operation of the display device. According to the invention, a wireless communication link is included in the communication path between the processing device and the display device. By employing the wireless communication link to transmit the display operation information to the rotatable display device, the display device may be controlled to change graphic images and produce animations while the support structure is rotating within the gaming machine cabinet, and without having to rely on a mechanical slip ring arrangement for communicating data/control instructions for the display device.

[0010] The wireless communication link employed according to the invention may use any suitable type of wireless technology. For example, the wireless communication link may utilize radio frequency (RF) transmissions. Alternatively, the wireless communication link may utilize transmissions by visible or non-visible light (optical transmissions), such as infrared light transmissions for example.

[0011] Certain elements may be described as “stationary” or “fixed” in the present disclosure and accompanying claims. For example, a processing device or transmitter/receiver may be described as being stationary or fixed. The terms “stationary” and “fixed” in this sense means that the respective element is not adapted to rotate with a rotatable support structure supporting a display device. Various communications links or transmission paths may also be referenced in describing the present invention. As used below and in the accompanying claims, a “wireless communication link” refers to a wireless communication arrangement that facilitates the wireless transmission of information (data and/or instructions) from a transmitting device to a receiving device. A “communication path” refers to an arrangement which facilitates the communication of data and/or instructions from a first device to a second device, and may include one or more path segments. The data and/or instructions may change forms one or more times over a given communication path, or may result in a sequence of communications that ultimately affects the operation of the second device. Also, a “wireless transmission path” refers to a path in which transmissions travel from a wireless transmitter to a wireless receiver.

[0012] One preferred method embodying the principles of the present invention includes generating display operation information to be used in controlling graphics produced by a display device. This display operation information is transmitted over a wireless transmission path from a transmission point within a gaming machine cabinet. This method also includes receiving the display operation information at a receiving point within the gaming machine cabinet. The receiving point is separated from the transmission point along the wireless transmission path so that the devices used to transmit the display operation information and the device used to receive the information may be mounted on separate structures in the gaming machine

cabinet. In particular, the transmitter may be mounted in a fixed position in the gaming machine cabinet and the receiver may be mounted on a structure that is adapted to rotate with respect to the gaming machine cabinet, such as a gaming machine reel structure or wheel structure.

[0013] These and other advantages and features of the invention will be apparent from the following description of the preferred embodiments, considered along with the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0014] **FIG. 1** is a representation of portions of a reel-type gaming machine according to one form of the present invention, the gaming machine including three rotatable reels.

[0015] **FIG. 2** is a perspective view showing another type of rotatable reel for a reel-type gaming machine embodying principles of the present invention.

[0016] **FIG. 3** is a perspective view of yet another type of reel for a reel-type gaming machine within the scope of the present invention.

[0017] **FIG. 4** is a flow diagram illustrating a gaming method that may be employed according to the present invention.

[0018] **FIG. 5** is a flow diagram illustrating a method of providing display control information according to the present invention.

[0019] **FIG. 6** is a diagrammatic representation of one preferred arrangement for a wireless communication link to the reel-mounted display devices.

[0020] **FIG. 7** is a mostly diagrammatic side view of a rotatable reel according to one form of the invention.

[0021] **FIG. 8** is a diagrammatic representation of an alternate preferred arrangement for the wireless communication links employed in the present invention.

[0022] **FIG. 9** is a diagrammatic front view of a rotatable reel and infrared wireless communications link that may be used in embodiments of the present invention.

#### DESCRIPTION OF PREFERRED EMBODIMENTS

[0023] **FIG. 1** shows rotatable three reels **100** for a reel-type gaming machine according to principles of the present invention. Each of the three reels **100** is shown with a display device **102** such as a flexible liquid crystal display (LCD) or organic light-emitting diode (OLED) display mounted so as to serve as a portion of the curved surface **104** making up the periphery of the respective reel. Each of the displays **102** is illustrated displaying a symbol. A first one of the displays **102** shows the symbol “X,” a second one of the displays shows the symbol “Y,” and a third one of the displays shows the symbol “Z.” It should be appreciated that the displays **102** may display symbols other than the illustrated symbols. For example, the symbols displayed by the display devices **102** may be symbols such as bells, cherries, bars, or any other images suitable for use as reel symbols in reel-type gaming machines. Although not shown in **FIG. 1** to simplify the drawing, it will be appreciated that in addition to displays **102**, various static symbols are por-

trayed at different locations along the peripheral curved surface **104** of each respective reel **100**. These static symbols, together with the respective display **102**, form a generally continuous set of symbol locations along the respective peripheral surface **104**. In addition to reels **100**, **FIG. 1** also shows a processing (CPU) **110** for the reel-type gaming machine in which reels **100** are included. The embodiment shown in **FIG. 1** also includes a dedicated graphics processor **112** interposed between CPU **110** and displays **102** for producing the instructions and signals necessary to cause displays **102** to produce the desired graphics.

[0024] Those familiar with reel-type gaming machines will appreciate that reels **100**, the structure supporting the reels for rotation and related elements, CPU **110**, graphics processing device **112**, and other components of the gaming machine are mounted in a gaming machine cabinet. The precise form of the gaming machine cabinet is not necessary for an understanding of the present invention and thus the gaming machine cabinet itself is omitted from the drawings.

[0025] Each reel **100** shown in **FIG. 1** includes a support structure which ultimately functions to support the elements making up peripheral surface **104**. The support structure of each reel is mounted for rotation within the gaming machine cabinet and allows the peripheral surface **104** to rotate about the rotational axis of the reel. The invention is not limited to any particular rotatable support structure or arrangement for supporting the support structure for rotation within the gaming machine cabinet. As will be described further below in connection with **FIG. 6**, one preferred support structure includes an axle or hub with a number of spokes which support a backing or frame. This backing or frame in turn supports either a reel film which provides static graphics for the reel, or one or more display devices such as display device **102**.

[0026] When a player activates a gaming machine in which reels **100** are included, either by pulling a lever, pushing a "PLAY" button, or operating some other activating device (not shown in the figures), reels **100** are caused to rotate about their common axis A in **FIG. 1**. There are many alternate arrangements that may be used in a gaming machine to cause reels such as reels **100** to rotate, and then ultimately stop so that various symbols shown on the peripheral surface **104** of each reel align along one or more paylines defined for the gaming machine. These reel driving and control arrangements form no part of the present invention, and are thus not described here in detail. However, it will be appreciated by those skilled in the art of reel-type gaming machines that a suitable reel driving arrangement may include a mechanical linkage (not shown) between a player actuating lever and the reels. Alternatively, reels may be caused to rotate by one or more motors (not shown) preferably operated under the control of a CPU **110** or some other suitable controller. Any suitable arrangement may be used to cause the rotating reels to stop and thereby show the results of a play of the gaming machine by the reel symbols aligned along one or more paylines through the displayed reel symbol locations.

[0027] According to the present invention, one or more processing devices such as CPU **110**, or the CPU combined with one or more dedicated graphics processors such as processor **112** drive each of the displays **102**. In one pre-

ferred embodiment, a main processing device such as CPU **110** cooperates with a separate graphics processor **112** for each display **102** or for each of a number of groups of displays **102**. Such a separate graphics processor may be located externally to the respective rotatable reel **100**, or internally to the respective reel. That is, the graphics processor that controls the graphics produced by a respective display **102** may be mounted on the rotatable reel **100** on which the respective display is mounted, or may be mounted in a stationary position in the gaming machine cabinet. Regardless of whether the images displayed on displays **102** are controlled through a single main processing device such as CPU **110** or the CPU in cooperation with one or more dedicated graphics processors, the image or symbol displayed at each display **102** may include continuous or intermittent animations or may change or remain constant during the course of a play at the gaming machine including reels **100**.

[0028] It will be appreciated from the above description that display operation information must ultimately be communicated to the reel-mounted displays **102** from a device mounted in a stationary position in the gaming machine cabinet, that is, a device mounted separately from rotatable reels **100**. In order to accommodate the communication of display operation information to a respective reel-mounted display **102**, the present invention includes a wireless communication link in a communication path to the respective reel-mounted display. Examples of preferred wireless communication links will be described below with reference to **FIGS. 5 through 8**. This wireless communication of display operation information for the reel-mounted displays **102** eliminates the need for a mechanical arrangement such as a slip ring for communicating display operation information to the reel-mounted displays. However, a slip ring or other suitable mechanical arrangement may still be included in an apparatus according to the invention to enable operating power to be supplied to displays **102** and other electrical components mounted on the rotatable reels.

[0029] **FIG. 1** shows a single display **102** on each reel **100**, with the display spanning only a single reel symbol location. Other forms of the invention may include a display that is sufficiently long to span two or more adjacent symbol locations about the peripheral surface of the respective reel. Each such location on a longer single display may be driven to show a separate symbol, or a single symbol may span two or more symbol locations.

[0030] As shown in **FIG. 2**, an alternate arrangement according to the invention may include a rotatable reel **200** having multiple distinct displays **202**. Although two adjacent displays **202** are shown in **FIG. 2**, it will be appreciated that the multiple distinct displays **202** may be spaced apart at different locations around the peripheral surface of reel **200**. As with **FIG. 1**, **FIG. 2** omits the standard static graphic symbols located at locations of the reel peripheral surface not occupied by displays **202**. Also, as described above in connection with displays **102**, displays **202** are driven or controlled through a suitable processing arrangement to display various animated or non-animated symbols, and to change the displayed symbols in any way desired during the course of a game play or over the course of multiple game plays at a gaming machine including reel **200**.

[0031] **FIG. 3** shows yet another type of reel **300** according to the invention for use in a reel-type gaming machine.

In the embodiment of **FIG. 3**, reel **300** includes a curved display **302** extending around the entire peripheral, cylindrical reel surface. It will be appreciated that in this form of the invention, display **302** must be driven or controlled to provide or show the desired symbol (if any) at each symbol location on the peripheral surface of reel **300**. As in the embodiments described above with reference to **FIG. 1**, curved display **302** on reel **300** may be driven or controlled by any suitable processing device or combination of processing devices to display the desired graphics in the course of a play in reel-type game, or between game plays. As with the previously described displays **102** and **202**, display operation information for use in controlling the operation of display **302** is communicated to the display through a wireless communication link.

[0032] It should be noted that displays **102**, **202**, and **302** shown in **FIGS. 1, 2, and 3**, respectively, are shown with a certain thickness. This display thickness is exaggerated for purposes of illustration and clarity in the drawings. It will be appreciated that an actual display device that may be employed according to the invention may have a lesser or greater thickness relative to the size of the respective reel. Displays **102**, **202**, and **302**, are also each shown as curved displays in which the display surface actually matches the curvature of the peripheral surface of the reel, or actually forms the entire peripheral surface in the case of display **302**. Although these curved displays are preferred in order to better match the traditional appearance of a reel-type gaming machine, the invention is not limited to use with curved display devices. Rather, a display for use on a reel of a reel-type gaming machine according to the present invention may be a flat display. For example, each symbol location on a reel may comprise a flat surface so that the entire peripheral surface of the reel forms a polygon in side view. Also, it should be noted that the wireless communication arrangement according to the invention is not limited to reel-type gaming machines, but has application to any gaming machine in which a display device is mounted on a structure that is adapted to rotate with respect to the gaming machine cabinet. For example, a display may be mounted on a wheel which is adapted to be rotated about an axis that is perpendicular to the plane of the display surface. In this example, a wireless communication link according to the invention may be used to communicate display operation information for use in controlling the operation of the wheel-mounted display device.

[0033] The flow diagram of **FIG. 4** illustrates a gaming method embodying principles according to the present invention that may be performed in a gaming machine using any of the reels shown in **FIGS. 1 through 3**. At process block **402** a player enters a wager via a suitable interface at the gaming machine and initiates a play at the gaming machine by pulling a handle associated with the machine, or pressing a button, or activating some other input device at the gaming machine. At process block **406**, the gaming machine may control the display or displays **102**, **202**, or **302** to show or produce the desired symbol at the reel symbol location or locations encompassed by the respective display. Ultimately, the gaming machine displays a result for the game play as indicated at process block **407**. The result in a reel-type game for example is displayed through a series of symbols arranged along a payline of the gaming machine. This series of symbols correlates to a result for the play. A symbol shown on a rotatable display according to the

invention may be included on a payline for the gaming machine and thus help show a result to the player. After the gaming machine displays the result of the game play as indicated at process block **407** the process loops back to process block **402** for the next game cycle. The sequence of steps shown in **FIG. 4** repeats for each game cycle.

[0034] It will be noted that displays **102**, **202**, and **302** each provide an opportunity for producing interesting effects and/or interesting game characteristics at a gaming machine using such displays. As one example, the symbol presented or shown by one of the displays at any given reel location may be animated, rather than static. Also, it is possible for the symbol to be changed during the course of play. For example, a non-winning series of symbols may initially be displayed as a game result, and then one or more symbols along a payline may change to show a winning series of symbols for the play result.

[0035] The step of controlling the display device or devices shown at process block **406** in **FIG. 4** may be performed in a number of fashions within the scope of the present invention. The flow diagram of **FIG. 5** may be used to describe one process for controlling a display device mounted on rotatable structure within a gaming machine. As indicated at process block **501**, the display operation information is first generated by a suitable device mounted in a stationary position in the gaming machine cabinet, separate from the reel on which the respective display device is mounted. As indicated at process block **502**, this display operation information is then transmitted over a wireless transmission path by a suitable transmitting device. Example transmitting devices will be described below with reference to **FIGS. 6 through 9**. The transmitted display operation information is received as indicated at process block **503**. This reception is performed by a suitable receiving device such as the receiving devices described below in connection with **FIGS. 6 through 9**. Finally, the display operation information is used to cause the display device or devices to produce the desired graphics as shown at process block **504**.

[0036] **FIG. 6** shows one preferred arrangement for wireless transmission of display operation information from fixed devices mounted in a gaming machine cabinet to video display control devices mounted on rotatable reels associated with the gaming machine. The stationary components shown in **FIG. 6** include a CPU **601** which corresponds to the gaming machine CPU **110** shown in **FIG. 1** and described above. A radio frequency transmitter/receiver (RF TX/RX) **603** is also mounted in a stationary fashion within the gaming machine cabinet along with an interface **602** between the CPU and radio frequency transmitter/receiver. CPU **601** communicates with interface **602** across a suitable transmission line or bus **604** and interface **602** communicates with RF transmitter/receiver **603** across a suitable transmission line **605**. CPU **601** is thus operatively connected to RF transmitter/receiver **603** to control the transmission of display operation information from that RF transmitter/receiver.

[0037] **FIG. 6** assumes that there are three rotatable reels associated with the gaming machine, although the reels themselves and the gaming machine are not shown due to the block format of the figure. Each of the rotatable reels includes one or more video displays such as the displays described above in connection with **FIGS. 1 through 3**.

Each rotatable reel includes a respective reel graphics controller which receives display operation information via wireless communication from radio RF transmitter/receiver 603, and ultimately uses that information to drive the respective display or displays mounted on that particular reel. In particular, a first reel graphics controller 606 is associated with the first rotatable reel on the gaming machine, a second reel graphics controller 607 is associated with a second rotatable reel, and the third reel graphics controller 608 is associated with the third rotatable reel associated with the gaming machine. In this preferred implementation, all of the reel graphics controllers are identical, each including a video processor 610, random access memory 611 and 612, a transmitter/receiver interface 614, and RF transmitter/receiver 615. In each respective reel graphics controller 606, 607, and 608, the respective video processor 610 ultimately operates to produce video input signals for driving a respective video display device such as display device 102 shown in FIG. 1, display device 202 shown in FIG. 2, or display device 302 shown in FIG. 3. Each respective RF transmitter/receiver 615 operates to direct the respective display operation information to the respective video processor 610 for use in controlling the operation of the respective display device.

[0038] It will be noted that in the arrangement shown in FIG. 6, only power for the reel mounted electronic components is supplied through a mechanical arrangement. That is, although display operation information is communicated to the reel-mounted components via the wireless communication link provided by RF transmitter/receiver 603 and RF transmitter/receiver 615, a mechanical arrangement such as suitable slip ring allows operating power to be supplied to the reel-mounted electronic devices on the respective reel as the reels rotate with respect to the gaming machine cabinet. Although not shown in FIG. 6, it will be appreciated that various power supply filters or conditioning electronics may be included with the reel graphics controllers to eliminate any power fluctuations occasioned by the slip ring arrangement.

[0039] The invention is not limited to any particular type of bus or transmission line 604 or communication connection 605 between interface 602 and RF transmitter/receiver 603. One convenient implementation employs an ethernet adapter as the interface 602 which communicates with CPU 601 across a suitable bus such as a PCI bus. Communications between interface 602 and RF transmitter/receiver 603 may comprise ethernet communications. In this arrangement, RF transmitter/receiver 603 may comprise a wireless ethernet hub or switch that may communicate to the various reel mounted electronic devices through a suitable communications protocol such as TCP/IP. This communications arrangement allows the single RF transmitter/receiver 603 to communicate respective display operation information to reel-mounted electronics on each of the reels. Display operation information for a particular one of the reel graphics controllers, for example controller 606, may be addressed to that controller through the communications protocol while display operation information for another one of the reel graphics controllers 607 or 608 may be addressed to that respective controller through the communications protocol. For example, each reel graphics controller may be assigned a respective static or dynamic IP address to facilitate addressing the respective controllers. Any suitable wireless communications protocol may be employed for the RF

communications across the wireless transmission path between RF transmitter/receiver 603 and the respective RF transmitter/receiver 615. For example, the wireless communications may be provided in accordance with IEEE 802.11a, 802.11b, or 802.11g.

[0040] As with the stationery cabinet-mounted electronics, any suitable connections may be used between the reel mounted RF transmitter/receiver 615, its respective interface 614, and respective video processor 610. One convenient implementation integrates the interface 614 and RF transmitter/receiver 615 similarly to a PC card or PCI card wireless network adapter, and a PC bus or PCI bus is provided for communications with video processor 610.

[0041] Each reel graphics controller 606, 607, and 608 preferably includes sufficient random access memory 611 and 612 to provide a suitable frame buffer and also to store video image related data at the respective reel graphics controller. It will be appreciated that video image related data may be stored in other types of memory rather than random access memory 611 and 612. For example rather than random access memory 611 and 612, or in addition to this random access memory, a respective reel graphics controller may include a flash memory device or other nonvolatile memory for storing video image related data.

[0042] Despite the addressing arrangements that may be used to allow the single RF transmitter/receiver 603 to communicate with each of the reel graphics controllers 606, 607, and 608 shown in FIG. 6, additional steps may be required in order to prevent crosstalk, interference, or inadvertent communications from the RF transmitter/receiver 603 to reel graphics controllers that may be located in adjacent gaming machines. Various arrangements may be employed to prevent such crosstalk or interference. One preferred arrangement for reducing the possibility of interference from RF transmitter/receiver 603 to reel graphics controllers in adjacent gaming machines utilizes a directional transmission arrangement. The directional transmission and reception range for RF transmitter/receiver 603 may be limited so that the device does not transmit signals at significant power levels in the direction of an adjacent gaming machine. For example, RF transmitter/receiver 603 may be mounted in the gaming machine cabinet above and in back of the reel structures, with the antenna associated with the transmitter/receiver pointing directly toward the three reels of the gaming machine and limited to a transmission and reception range of approximately 120 degrees about a centerline for the gaming machine. In addition to limiting RF transmitter/receiver 603 to directional transmissions aimed at the three reels for the respective gaming machine, the transmission power may be limited to help avoid the possibility of receiving the transmissions at another gaming machine. Also, shielding may be employed in the gaming machine cabinet to help block RF transmissions from transmitter/receiver 603.

[0043] It should be noted in the example of FIG. 6 that the path that extends from CPU 601 ultimately to a respective video display comprises a "communication path" as used in this disclosure and the accompanying claims. The combination of RF transmitter/receiver 603 and a respective RF transmitter/receiver 615 provide a "wireless communication link" as used herein, and the transmission path from RF transmitter/receiver 603 and a respective RF transmitter/receiver 615 represents a "wireless transmission path."

[0044] FIG. 7 shows a diagrammatic representation of a rotatable reel 701 that may support one or more curved video displays according to the present invention. Although not shown in FIG. 7, the curved video displays would be supported about a peripheral backing/frame portion 704 of reel 701. The illustrated reel 701 includes a support structure that includes a hub or axle 702 and support members (spokes) 703 which extend from the axle or hub to the peripheral backing/frame 704. A reel graphics controller 705 which may correspond to one of the graphics controllers 606, 607, or 608 shown in FIG. 6 may be mounted conveniently on one of the support members 703. It may be necessary to add a counter balance 706 on another one of the support members 703 in order to balance the reel for rotation on the axle 702. It will be appreciated that some rotatable reels according to the invention may have a sufficient number of video displays to require one or more additional reel graphics controllers 705. Any additional reel graphics controller 705 may be supported in any suitable fashion, such as on a respective reel support member 703. Additional counterbalancing may be required in order to balance reel 701. Although not shown in FIG. 7, electrical connections are required from reel graphics controller 705 to the display device or devices (not shown) mounted on the peripheral backing/frame 704. Also, a slip ring (not shown) associated with axle or hub 702 facilitates the transfer of operating power for reel graphics controller 705, and this power must be communicated from the axle or hub to the controller 705 through a suitable power connection. The slip ring and power connections to reel graphics controller 705 are omitted from FIG. 7 in order to simplify the drawing.

[0045] FIG. 8 shows an alternate arrangement for wireless communications from fixed components in the gaming machine cabinet to reel-mounted electronics according to the present invention. As with FIG. 6, FIG. 8 omits the reels themselves and structural elements of the gaming machine. The alternate arrangement shown in FIG. 8 employs infrared (IR) transmissions rather than RF transmissions as shown in the embodiment of FIG. 6. The stationary, cabinet-mounted components for this alternate arrangement shown in FIG. 8 include the CPU 800 which may correspond to CPU 110 shown in FIG. 1. CPU 800 communicates instructions to three separate arrangements of an interface 802 and IR transmitter/receiver 803, one interface and transmitter/receiver pair for each of the three reels included in the gaming machine. Each respective IR transmitter/receiver 803 is adapted to communicate with a particular one of three reel graphics controllers shown in FIG. 8, namely reel graphics controllers 806, 807, or 808.

[0046] The reel-mounted components for the embodiment shown FIG. 8 are similar to those for the reel-mounted components shown in FIG. 6. However, rather than a RF transmitter/receiver, each reel graphics controller shown FIG. 8 includes an IR transmitter/receiver 815. An interface 814 provides an interface between transmitter/receiver 815 and video processor 810, and random access memory 811 and 812 provide memory for the operation of the video processor and perhaps for long-term storage of video image related data. As in the arrangement shown in FIG. 6, only the power for operating the reel-mounted devices is provided through a slip ring associated with the respective reel. All display operation information is preferably transmitted in a wireless fashion using the IR transmitters/receivers 803 and 815.

[0047] Numerous different types of buses 801 may be used for communications between CPU 800 and the interfaces 802. One convenient implementation employs a suitable standard such as PCI bus for bus 801. Each interface 802 provides an interface between this bus and IR transmitter/receiver 803. Similarly to the arrangement shown in FIG. 6, any suitable communications standards and protocols may be employed for communications between the respective IR transmitter/receiver 803 and IR transmitter/receiver 815, and between IR transmitter/receiver 815, interface 814, and video processor 810.

[0048] FIG. 9 provides a diagrammatic representation of a reel 900 and a preferred arrangement for facilitating the infrared communications described in connection with FIG. 8 for the center reel, that is, the reel sandwiched between other reels. First reel 900 is mounted on an axle 902 that is supported within the gaming machine cabinet. The respective IR transmitter/receiver 815 is associated with axle 902 with the transmitting and receiving elements 903 mounted concentrically within axle 902 and facing outwardly. IR transmitter/receiver 803 is mounted to transmit along a line that is perpendicular to axle 902 and that intersects the longitudinal axis of the axle. A mirror 904 allows infrared signals communicated from IR transmitter/receiver 803 to be directed to the receiving elements associated with 903. Rather than the arrangement shown in FIG. 9, the outer reels may, of course, include the IR transmitter/receiver 803 in line with the particular reel axis.

[0049] It will be noted that the arrangements shown in FIGS. 6 and 8 allow communications to and from the reel-mounted components. However, other forms of the invention may only allow one-way communications from the gaming machine main processor (701, 801) to the reel-mounted graphics controllers.

[0050] The present invention encompasses numerous variations on the specific example structures described above in connection with FIGS. 6 through 9. For example, although the RF wireless communication arrangement shown in FIG. 6 operates in a broadcast mode in which a single RF transmitter/receiver 603 transmits to several different reel-mounted transmitter/receivers 615, a respective stationary transmitter/receiver may be included for transmissions to a respective reel-mounted transmitter/receiver. Also, although each reel-mounted transmitter/receiver 615 and 815 is shown incorporated with the respective reel graphics controller, these transmitters/receivers along with their respective interface may be separate from the respective reel graphics controller. Furthermore, optical communication links are not limited to infrared links, but may use any suitable wavelength(s) of light.

[0051] As used herein, whether in the above description or the following claims, the terms "comprising," "including," "carrying," "having," "containing," "involving," and the like are to be understood to be open-ended, that is, to mean including but not limited to. Only the transitional phrases "consisting of" and "consisting essentially of," respectively, shall be closed or semi-closed transitional phrases, as set forth, with respect to claims, in the United States Patent Office Manual of Patent Examining Procedures (Eighth Edition, August 2001 as revised May 2004), Section 2111.03.

[0052] Use of ordinal terms such as "first," "second," "third," etc., in the claims to modify a claim element does

not by itself connote any priority, precedence, or order of one claim element over another or the temporal order in which acts of a method are performed, but are used merely as labels to distinguish one claim element having a certain name from another element having a same name (but for use of the ordinal term) to distinguish the claim elements.

[0053] The above described preferred embodiments are intended to illustrate the principles of the invention, but not to limit the scope of the invention. Various other embodiments and modifications to these preferred embodiments may be made by those skilled in the art without departing from the scope of the invention.

1. An apparatus including:
  - (a) a first support structure mounted for rotation within a gaming machine cabinet;
  - (b) a first display device mounted on the first support structure;
  - (c) a processing device mounted in the gaming machine cabinet separate from the first support structure; and
  - (d) a first wireless communication link in a communication path between the processing device and the first display device for communicating first display operation information for use in controlling graphics produced by the first display device.
2. The apparatus of claim 1 further including a first video processor mounted on the first support structure for receiving the first display operation information and for producing video input signals for the first display device.
3. The apparatus of claim 1 wherein the first wireless communication link is a radio frequency communication link.
4. The apparatus of claim 3 wherein the first wireless communication link also communicates addressing information specific to the first display device and wherein the first display operation information is associated with the addressing information specific to the first display device.
5. The apparatus of claim 4 wherein the first display operation information is communicated in the form of a TCP/IP communication across the first wireless communication link.
6. The apparatus of claim 4 further including:
  - (a) a second support structure mounted for rotation within the gaming machine cabinet;
  - (b) a second display device mounted on the second support structure; and
  - (c) a second wireless communication link in a communication path between the processing device and the second display device for communicating second display operation information for use in controlling graphics produced by the second display device.
7. The apparatus of claim 6 wherein the second display operation information is communicated in the form of a TCP/IP communication across the second wireless communication link.
8. The apparatus of claim 6 wherein the first wireless communication path is between a first wireless receiver mounted on the first support structure and a wireless transmitter, and wherein the second wireless communication path is between a second wireless receiver mounted on the second support structure and the wireless transmitter.

9. The apparatus of claim 1 further including an additional display device mounted on the first support structure, and wherein the first wireless communication link also communicates additional display operation information for use in controlling graphics produced by the additional display device.

10. The apparatus of claim 1 wherein the wireless communication link is an optical communication link.

11. The apparatus of claim 10 wherein the optical communication link includes a light path aligned with an axis of rotation of the first support structure.

12. The apparatus of claim 10 further including:

- (a) a second support structure mounted for rotation within the gaming machine cabinet;
- (b) a second display device mounted on the second support structure; and
- (c) a second wireless communication link in a communication path between the processing device and the second display device for communicating second display operation information for use in controlling graphics produced by the second display device.

13. The apparatus of claim 12 wherein:

- (a) the first wireless communication link includes a first wireless transmitter mounted in a first fixed position in the gaming machine cabinet for transmitting to a first wireless receiver mounted on the first support structure; and
- (b) the second wireless communication link includes a second wireless transmitter mounted in a second fixed position in the gaming machine cabinet for transmitting to a second wireless receiver mounted on the second support structure.

14. An apparatus including:

- (a) a first support structure mounted for rotation within a gaming machine cabinet;
- (b) a first display device mounted on the first support structure;
- (c) a first wireless transmitter mounted in a first fixed position in the gaming machine cabinet;
- (d) a processing device mounted in the gaming machine cabinet and operatively connected to the first wireless transmitter to control the transmission of first display operation information from the first wireless transmitter, the first display operation information for use in controlling graphics produced by the first display device; and
- (e) a first wireless receiver mounted on the first support structure for receiving the first display operation information transmitted from the first wireless transmitter and directing the first display operation information for use in controlling the graphics produced by the first display device.

15. The apparatus of claim 14 further including:

- (a) a second support structure mounted for rotation within the gaming machine cabinet;
- (b) a second display device mounted on the second support structure; and

- (c) a second wireless receiver mounted on the second support structure for receiving second display operation information transmitted from the first wireless transmitter and directing the second display operation information on for use in controlling the graphics produced by the second display device, and
- (d) wherein the processing device also controls the transmission of the second display operation information from the first wireless transmitter.

16. The apparatus of claim 14 further including:

- (a) a second support structure mounted for rotation within the gaming machine cabinet;
- (b) a second display device mounted on the second support structure;
- (c) a second wireless transmitter mounted in a second fixed position in the gaming machine cabinet; and
- (d) a second wireless receiver mounted on the second support structure for receiving second display operation information transmitted from the second wireless transmitter and directing the second display operation information on for use in controlling the graphics produced by the second display device, and
- (e) wherein the processing device is also operatively connected to the second wireless transmitter to control the transmission of the second display operation information from the second wireless transmitter.

17. A method including:

- (a) generating first display operation information, the first display operation information for use in controlling graphics produced by a first display device;
- (b) transmitting the first display operation information over a first wireless transmission path from a first transmission point within a gaming machine cabinet; and

- (c) receiving the first display operation information at a first receiving point within the gaming machine cabinet separated from the first transmission point along the first wireless transmission path.

18. The method of claim 17 further including:

- (a) generating second display operation information, the second display operation information for use in controlling graphics produced by a second display device;
- (b) transmitting the second display operation information over a second wireless transmission path from the first transmission point within a gaming machine cabinet; and
- (c) receiving the second display operation information at a second receiving point within the gaming machine cabinet separated from the first transmission point along the second wireless transmission path.

19. The method of claim 17 further including:

- (a) generating second display operation information, the second display operation information for use in controlling graphics produced by a second display device;
- (b) transmitting the second display operation information over a second wireless transmission path from a second transmission point within the gaming machine cabinet, the second transmission point being spaced apart from the first transmission point; and
- (c) receiving the second display operation information at a second receiving point within the gaming machine cabinet separated from the second transmission point along the second wireless transmission path.

20. The method of claim 17 further including moving the first receiving device about a first rotational axis while the first display operation information is being received at the first receiving device.

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