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(54) Title of the Invention: **Gaming apparatus**
Abstract Title: **Casino table game having image based chip tracking**

(57) A gaming apparatus for providing a live casino table game wherein bets are placed by the placing of gaming chips on a gaming table in predefined areas of the table comprises image capture and processing apparatus, a processor and a memory device. The positions of gaming chips are detected by the image capture and processing apparatus. It is then determined whether or not the detected position is within a predefined area of the gaming table. This may be achieved by comparing the position of the chip to the positions of betting areas. Data relating to the amount of the bet and the player associated with the bet can also be stored. The value of betting chips can be detected through colour, size, pattern or shape. The mean position of a group of touching chips can be determined. Further disclosed is a gaming apparatus for providing an auxiliary jackpot game to a live casino table in which players may place gaming chips anywhere in a betting zone (32) defined on the gaming table surface to signify entry in the auxiliary jackpot game.

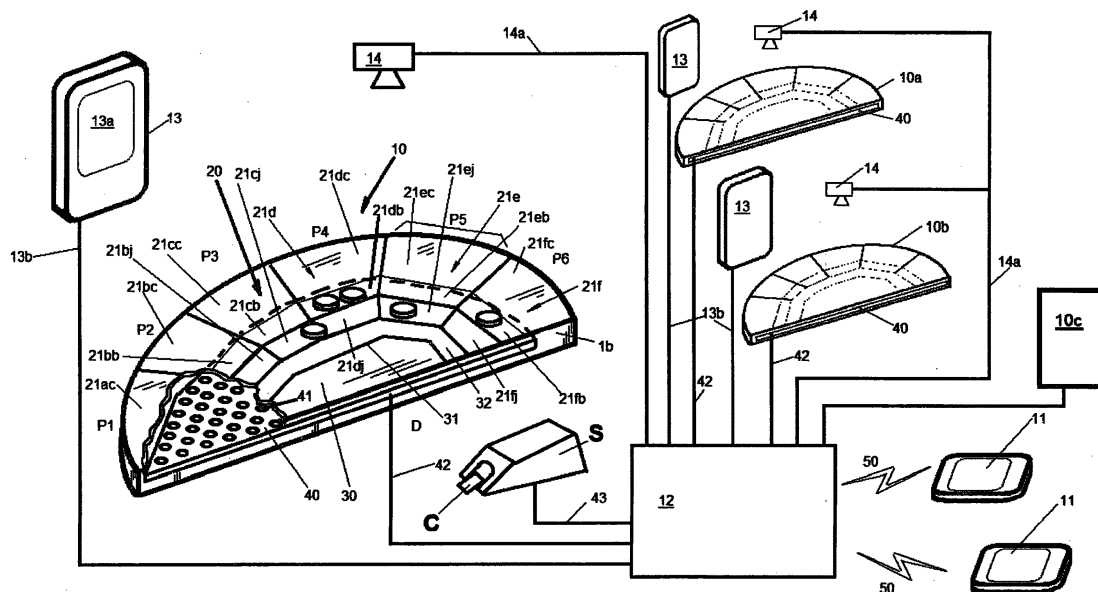


Fig 1

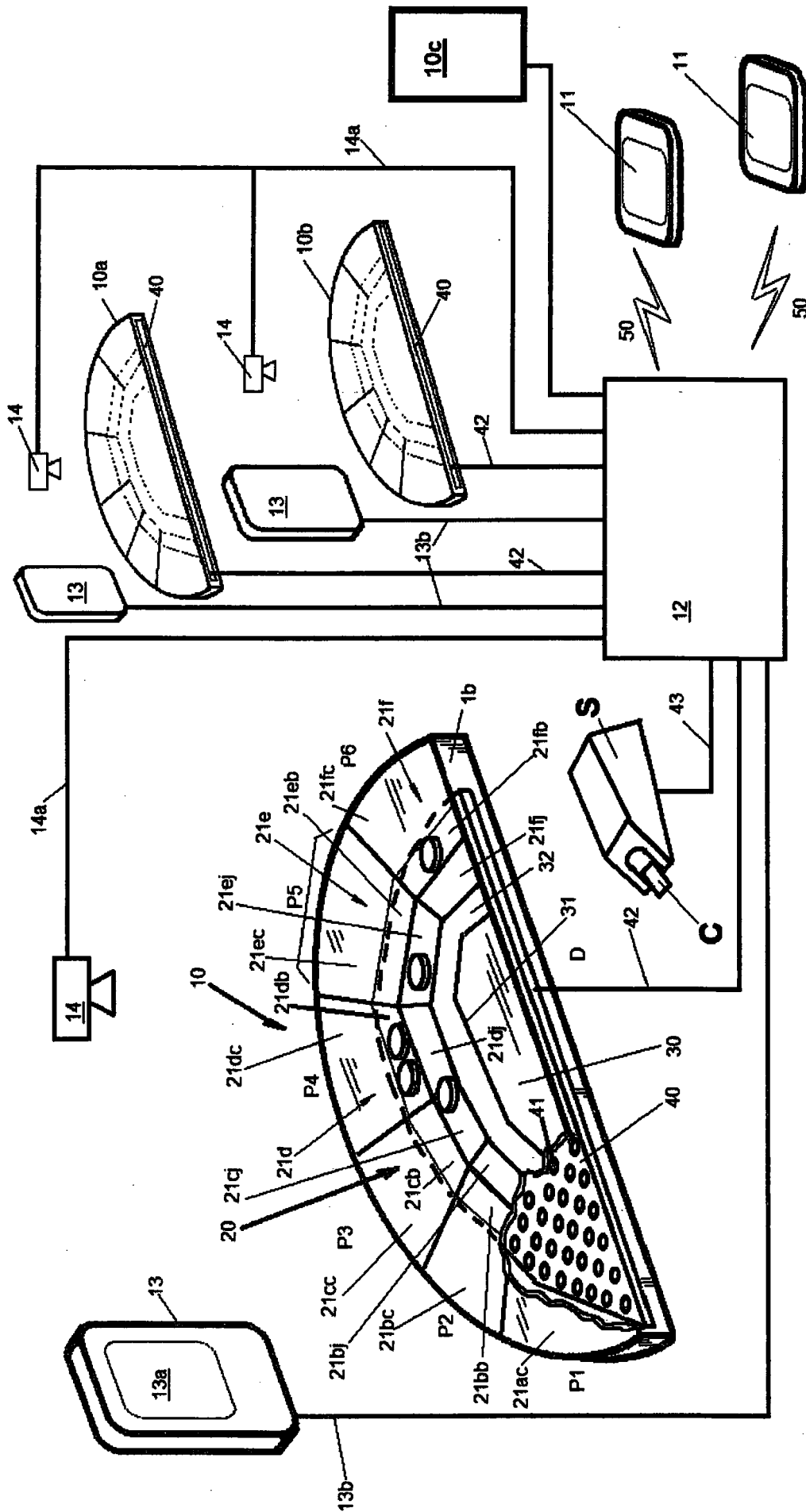


Fig 1

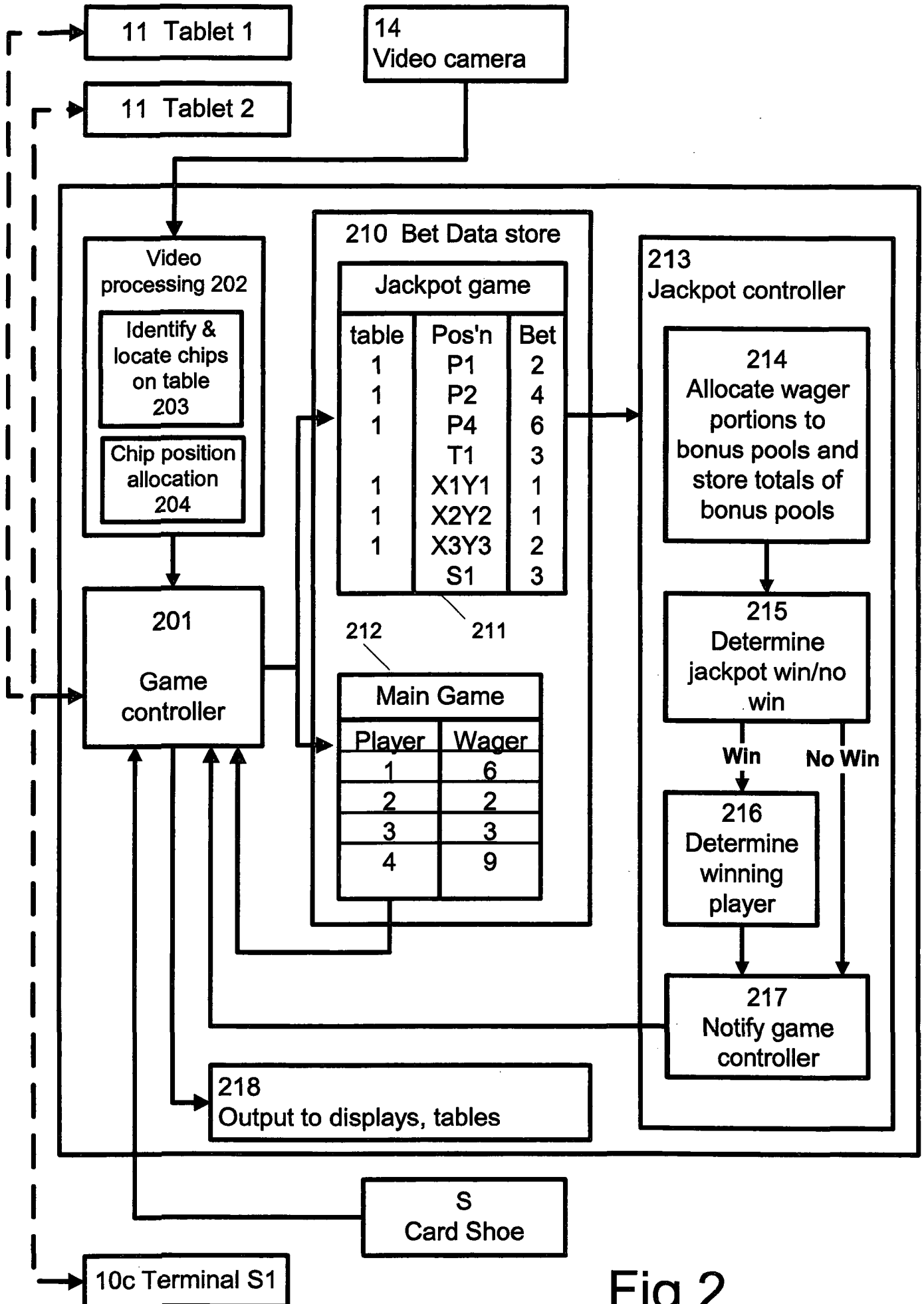


Fig 2

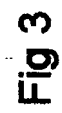
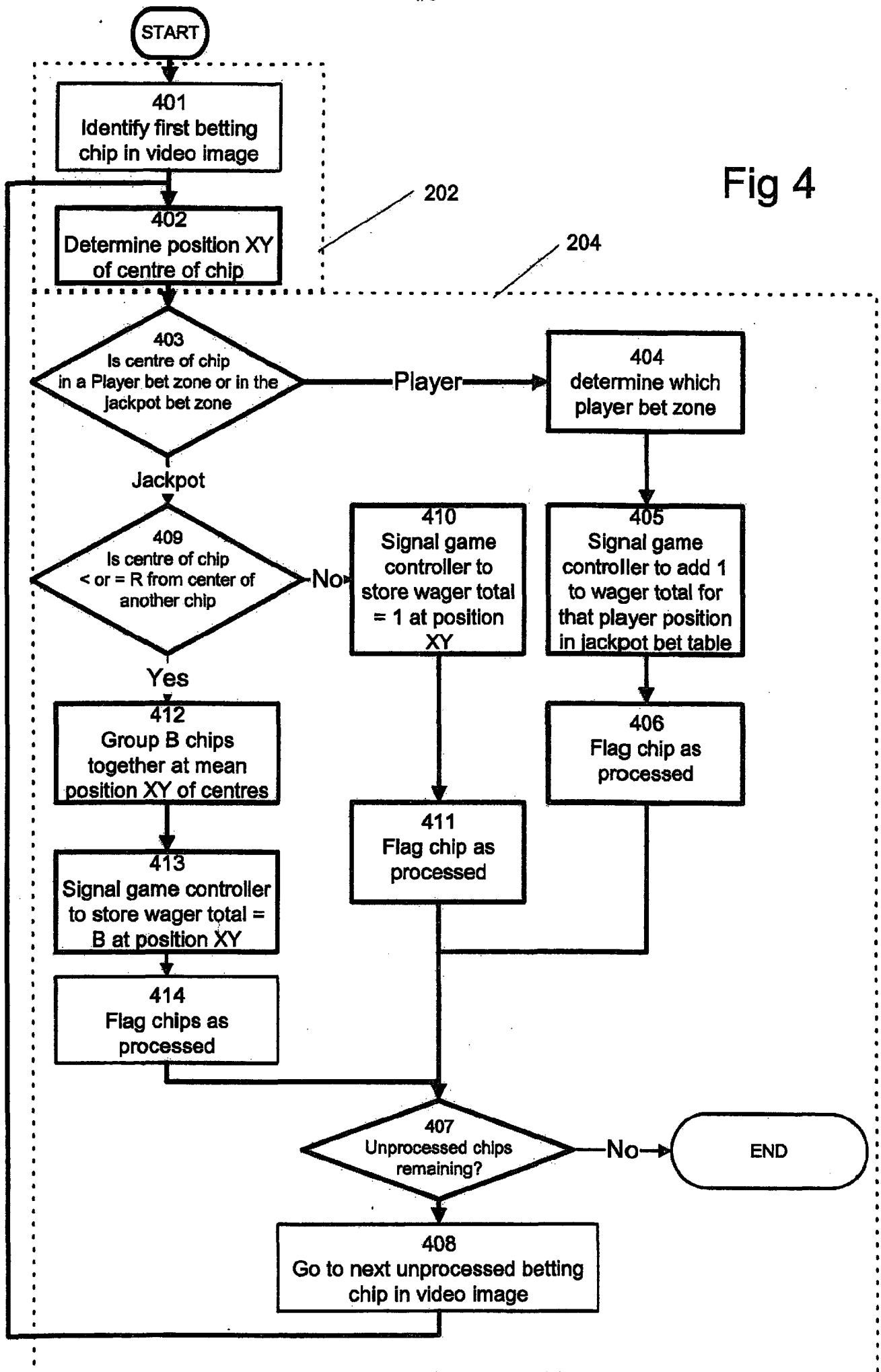


Fig. 3

Fig 4



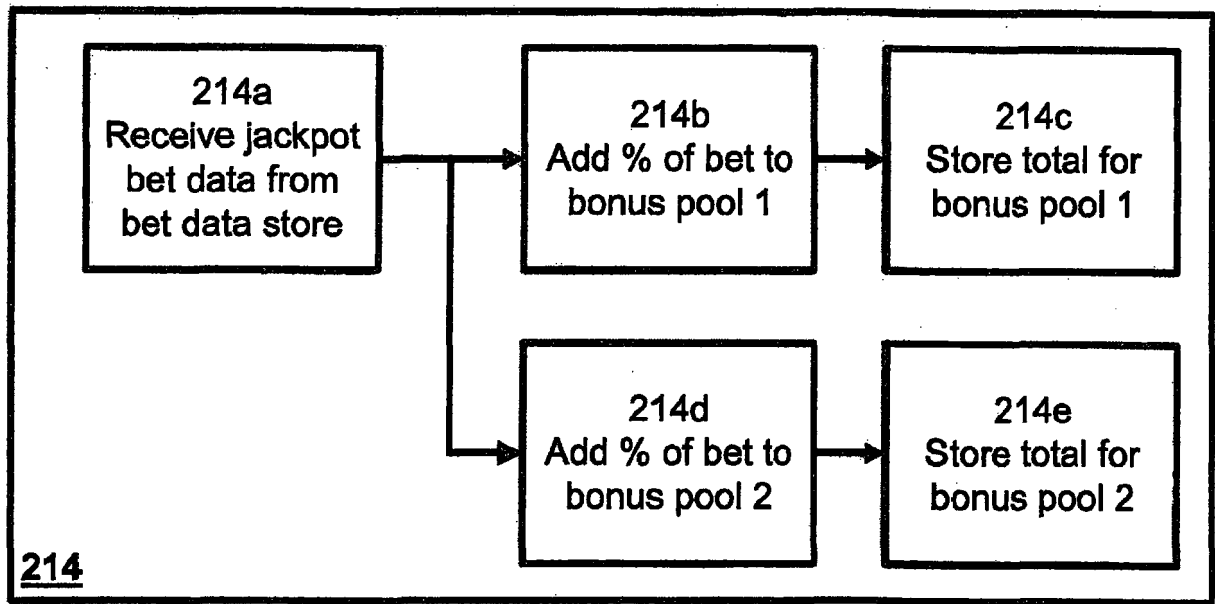


Fig 5

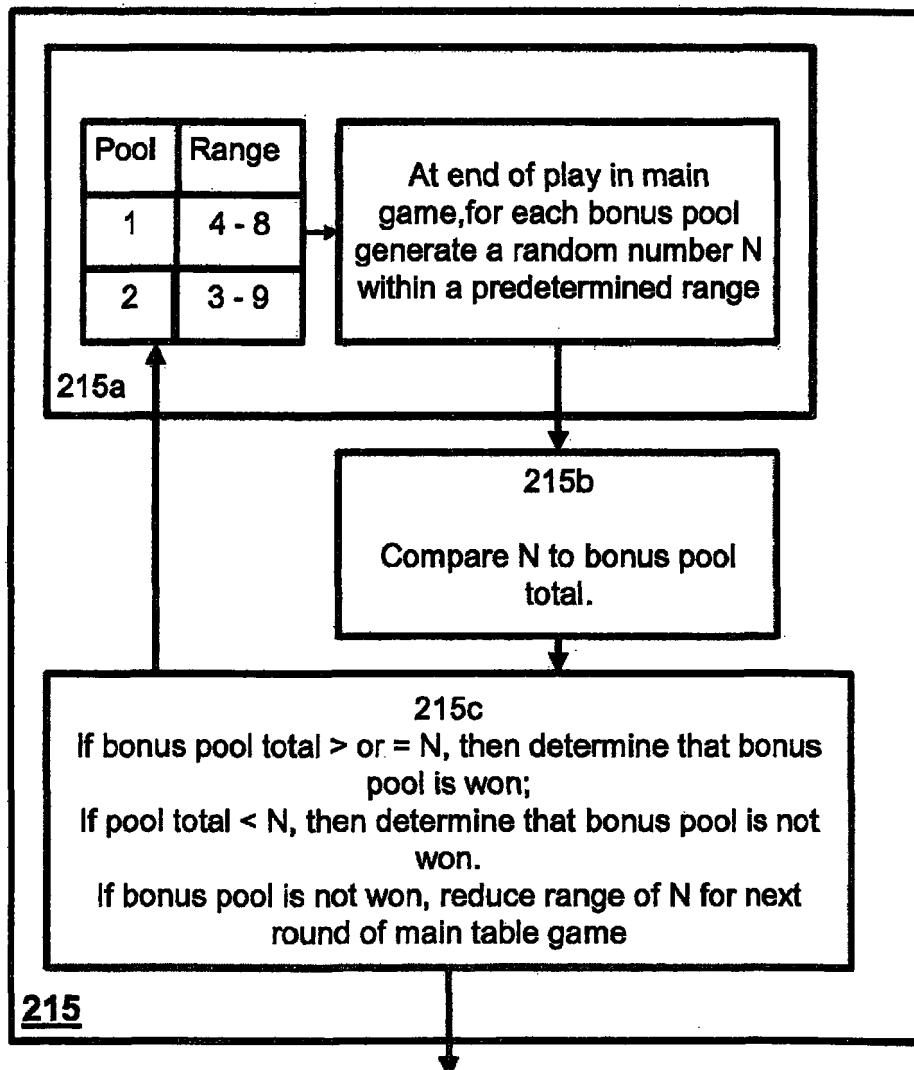


Fig 6

Fig 7

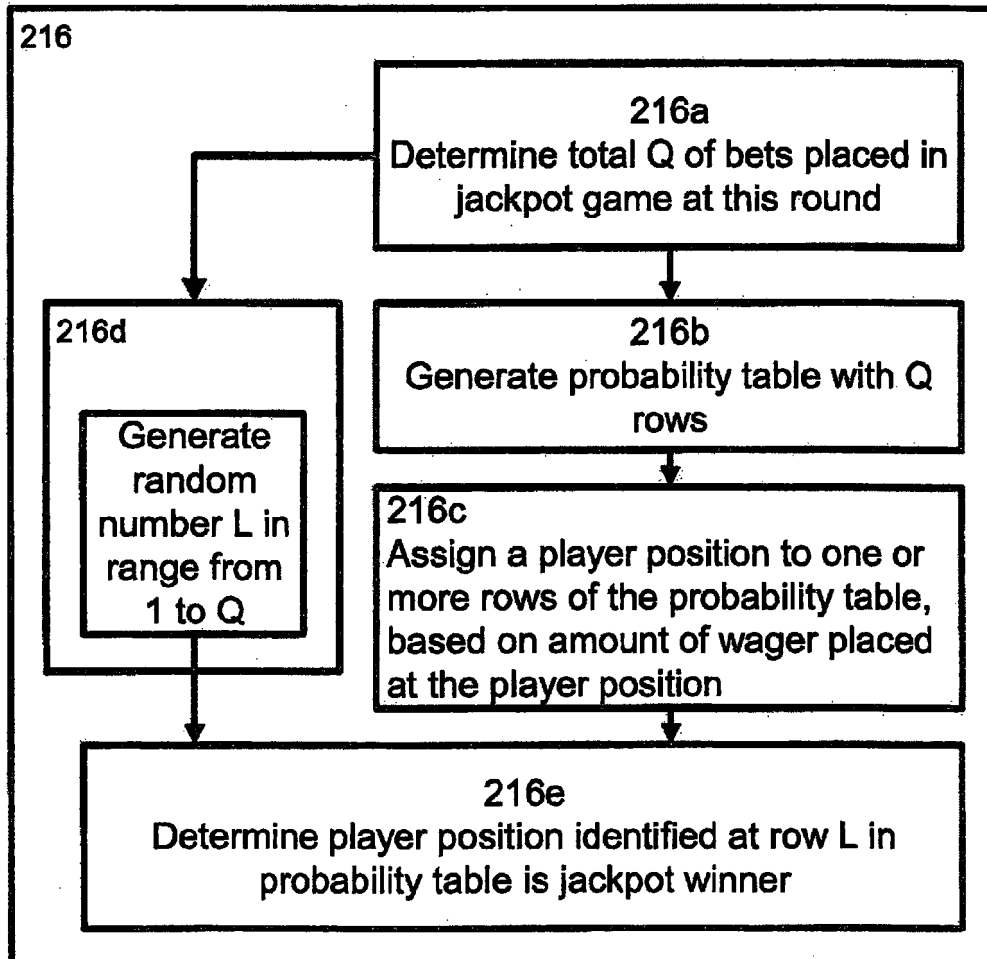
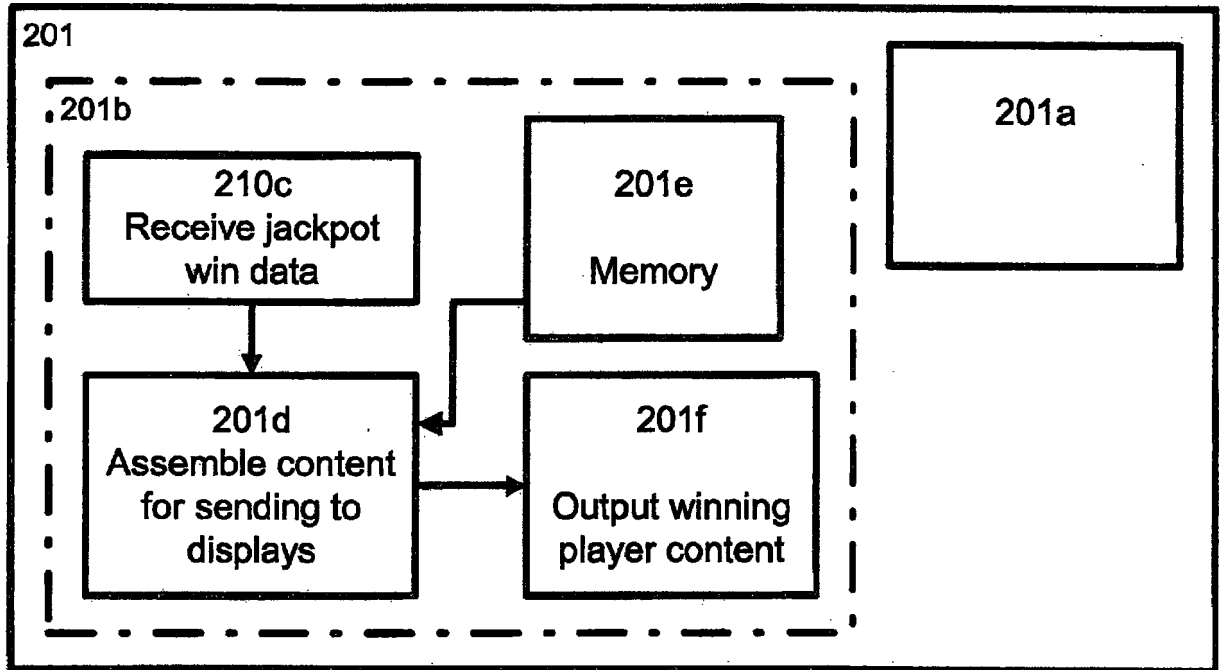


Fig 8

Probability table

Row	Player position
1	2
2	4
3	1
4	4
5	X1Y1
6	1
7	S1
8	4
9	2
10	S1
11	X2Y2
12	2
13	4
14	T1
15	2
16	X3Y3
17	4
18	T1
19	X3Y3
20	S1
21	4
Q = 22	T1

Fig 9

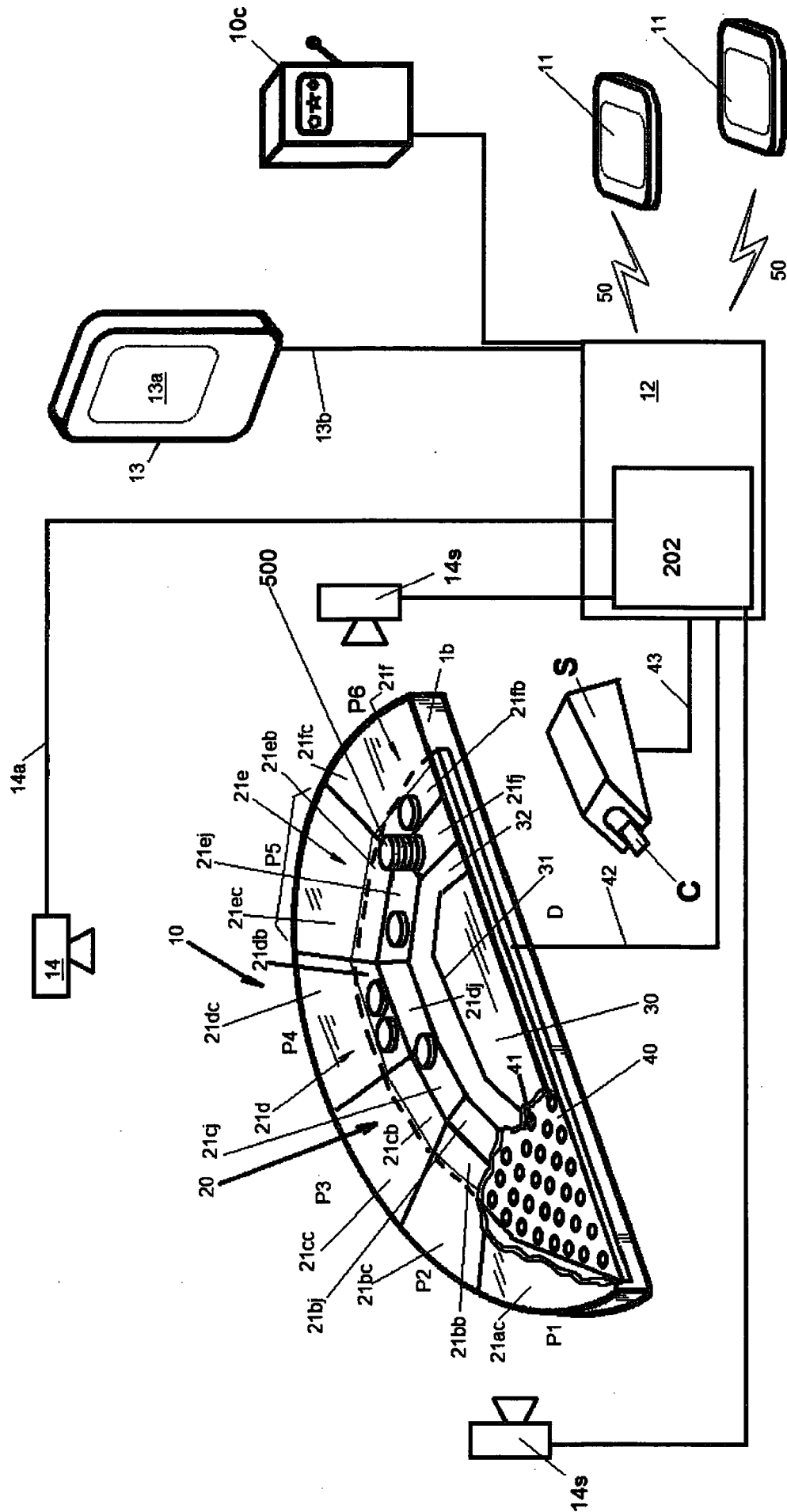


Fig 10

Gaming Apparatus

The present invention relates to gaming apparatus, and is particularly concerned with gaming apparatus in which a bonus game may be provided in conjunction with a main casino table game, and a method of providing an auxiliary jackpot game at one or more live gaming tables.

A casino typically offers table games to the patrons, the table games for example comprising card games such as poker and blackjack, or games of chance such as roulette, craps and Sic Bo.

Casino tables for card games typically have a number of player positions and a dealer position, marked on the table surface. Each player position typically includes a delineated "betting area", which is a section of the player position for the player to place his wager on the card game, and a separate "card area" which is a section of the player position into which the player's cards may be dealt. The dealer position includes a delineated area for the dealer to place cards for the house hand. Before each round of cards is dealt, players who wish to participate in the round place one or more betting chips in their respective betting area, and the dealer then delivers cards to each participating players part area. The betting area in which the chip or chips are placed associates that particular wager with one of the players.

Casino tables for games of chance such as roulette may have a plurality of player positions at which players may be seated round the roulette table, and a central betting area with the available betting options marked out by distinct sections of the betting area. In roulette, for example, there is an interval at the start of each game during which players are permitted to place bets on the outcome of that game by positioning one or more betting chips on a particular section of the betting area. Usually, the chips provided for each player are of a different colour or pattern from those of the other players, so that each wager may be associated with the player who placed it. At a certain point in the game, the croupier announces that no more

bets are to be placed, and the result of the game is then determined by the ball settling in a pocket in the roulette wheel. Losing bets are collected, winning bets are paid out, and the table is then declared open for the placement of bets for the next game.

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Additional interest and excitement may be generated at a roulette table by allowing patrons who are not seated at the table also to place bets by leaning over the seated patrons. While this does increase the number of players who can be accommodated at the roulette table, the additional workload on the croupier may slow down the rate of play, resulting in longer intervals that patrons must wait between games.

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In addition to the main game being offered at the casino table, whether it be a card game or a game using a gaming apparatus such as a roulette wheel or Sic Bo dice, many casinos additionally offer patrons at the table the opportunity to participate in a jackpot game.

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In jackpot games, players at the table contribute to a jackpot pool by placing "jackpot" bets in specific places on the gaming table, each place being associated with a respective player seated at the table. A jackpot may be awarded when a particular event occurs during the main game, such as a player achieving a straight flush in a poker game, or a particular number winning at roulette. Alternatively, a jackpot may be awarded in response to an event entirely unconnected with the table game, such as the total amount in the Jackpot pool exceeding a specific value.

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In PCT published application WO2012100286, there is described a method for playing an auxiliary progressive jackpot game associated with a casino table game, in which the casino table is modified to provide, for each player position at the table, a receptacle on which a single betting chip of a particular value may be placed to signify that the player is participating in the jackpot game. Participation in the jackpot game is limited to only those players seated at the casino table, the player's choice simply being to enter or not to enter the jackpot game during this round of

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the main table game.

The present invention provides, in one aspect, gaming apparatus which uses video image capture and processing to determine the positions of betting chips placed on a gaming table, and optionally also to determine the value of individual chips, and of groups or stacks of chips placed on a gaming table. Allocation of chips to associate chips placed on the table with one or more players may then be made on the basis of the position of the chip or chips on the gaming table.

In a second aspect, the present invention provides gaming apparatus which enables players other than those seated at the casino table to participate in the jackpot game, and in some embodiments enables players to select the value of the wager they place in the jackpot game.

In some casino environments, casino patrons not seated at a casino table may be able to participate in the table game via a remote gaming device linked to the gaming server. The remote device may be a mobile gaming device such as a smart phone, a tablet or other wirelessly connected device. Alternatively, the remote device may be a static gaming machine or a terminal, such as a slot machine, "fruit machine" or other gaming apparatus. Both static and mobile devices may be linked to the gaming server. A further aspect of the present invention provides gaming apparatus which enables casino patrons using a remote or mobile gaming device also to participate in the jackpot game irrespective of whether or not they are also participating in a game taking place at a table in the casino. For example, a player playing on a mobile gaming device, or on a fixed gaming apparatus such as a "fruit machine" or slot machine, may also participate in a jackpot game even though that player is not participating in a table game.

Embodiments of the invention will now be described in detail with reference to the accompanying drawings, in which:

Figure 1 is a schematic overview of a gaming system including a gaming server for providing a jackpot game in addition to casino table games at a number of gaming tables;

5 Figure 2 is a block diagram showing the principal components of the gaming server;

Figure 3 illustrates an example of betting chips placed on a gaming table;

10 Figure 4 schematically illustrates the detection and allocation of gaming chips;

Figure 5 schematically illustrates the distribution of jackpot bet monies between bonus pools;

15 Figure 6 schematically illustrates the determination of whether or not a jackpot is won;

Figure 7 illustrates the operation of the game logic when a jackpot win is determined;

20 Figure 8 illustrates the process for selecting the jackpot winner from amongst participating players;

Figure 9 illustrates a probability table used in the selection of the winner; and

25 Figure 10 illustrates a further embodiment of the invention, with additional cameras at table level.

The Illustrated Embodiments

30 Referring now to Figure 1 of the drawings, a gaming system 1 is illustrated comprising three gaming tables 10, 10a and 10b, a remote terminal 10c, and two

mobile gaming devices 11, all linked to a gaming server 12. In the illustrated embodiment, the tables are linked to the gaming server 12 by hardwiring, but may be linked wirelessly via a communications network. A gaming system according to the invention may comprise more or fewer than three gaming tables, and more or fewer than two mobile gaming devices. A respective display device 13 and a respective video camera 14 is associated with each of the gaming tables 10. A card dealing shoe S for delivering playing cards C is shown schematically adjacent one of the tables. The card dealing shoe S may alternatively be placed on the gaming table, at a position reserved for it. The cameras 14, displays 13 and one or more card dealing shoes S are linked to the gaming server 12, in the illustrated embodiment by respective signal lines 14a, 13b and 43. Alternatively, the cameras 14, displays 13 and card dealing shoes S may be linked to the gaming server 12 by a wireless communication system.

In the illustrated embodiment, each of the tables 10 is generally semicircular in form, with an arcuate side 1a and a straight side 1b. The table may of course be of any shape, as appropriate to the table game being played. The illustrated table has a baize playing surface 20, delineated to provide a number of playing areas 21a to 21f each corresponding to a player position P1 to P6 arranged around the arcuate side of the table 10. At the centre of the straight side of the table is a dealer position D. Adjacent the dealer position D, a dealer's area 30 is marked on the baize playing surface 20, bounded by a boundary line 31 and by a part of the straight side of the table.

The baize playing surface 20 may be delineated by having lines printed or otherwise marked on the baize to separate the playing areas 21a to 21f. Each of the playing areas 21a to 21f has a card area 21ac to 21fc adjacent the arcuate edge of the table, on which the player's cards will be placed during play. Adjoining each card area is a player's betting area 21ab to 21fb, in which each player will place his bet for the next round of the main card game being played on the table. In the example illustrated in Figure 1, the player seated at player station P4 has placed two betting

chips in his betting area 21db, and the player seated at player station P6 has placed one betting chip in his betting area 21fb.

5 Next to each player's betting area 21ab to 21fb is the player's jackpot bet area 21aj to 21fj. In the illustrated embodiment in Figure 1, the player at player station P3 has placed a chip in his jackpot bet area 21cj, and the player at player station P5 has placed a chip in his jackpot bet area 21ej.

10 In an arcuate region between the player's betting areas 21ab to 21fb and the boundary line 31 surrounding the dealer's area 30 is a jackpot bet zone 32. In this zone, betting chips may be placed by players other than those seated at the table in the player positions P1 to P6, and constitute bets in the next round of the jackpot game.

15 As can be seen in Figure 1, the left-hand side of the baize surface 20 is shown cut away, so that an LED display board 40 mounted beneath the baize surface 20 and supporting an array of upwardly-directed LEDs 41 may be clearly seen. The LEDs 41 and the baize surface 20 are selected such that light from the LEDs is visible through the baize surface. The LED display board 40 may extend beneath the baize
20 surface 20 over the entire area of the table. Alternatively, the LED display board may extend beneath only part of the baize surface 20. In a further alternative, a number of separate display boards may be mounted beneath respective areas of the baize surface 20. In the illustrated embodiment, the LED display board 40 extends beneath the player's betting areas 21ab to 21fb, beneath the player's jackpot bet
25 areas 21aj to 21fj, beneath the jackpot bet zone 32 and beneath the dealer's area 30.

The LED display board 40 is linked to the gaming server 20 to receive control signals for controlling the operation of the individual LEDs 41 to provide illumination and/or graphics and/or animation visible through the baize surface 20,
30 as will be described below. In the illustrated embodiment, a signal cable 42 links the LED display board 40 to the gaming server 12. Each of the LEDs 41 may be a

three-colour LED, and may be visible through the baize surface 20 as if it were a pixel of an image being displayed by the display board 40.

5 A display module 13 having one or more display screens 13a is mounted so as to be visible to the players at and around the table 10. The display module 13 is linked to the gaming server to receive control signals to control the display 13a. In the illustrated embodiment the display module 13 is linked to the gaming server 12 by a signal cable 13b. The display module 13 may display, for the information of the players, data relating to the game being played on the casino table 10, and/or data
10 relating to the current state of the jackpot game. For example, the current jackpot bonus pool total or totals may be displayed, with information indicating the last time a jackpot was awarded. The display module 13 may also information unrelated to the table game, such as a news bulletin, restaurant menu or promotional material.

15 In the illustrated embodiment, a video camera 14 is mounted above the gaming table 10 so as to record images of the gaming table, betting chips placed on the gaming table, and optionally also images of the players surrounding the table. The video camera 14 is connected to the gaming server 12 by a signal cable 14a in the
20 illustrated embodiment. More than one video camera 14 may be provided, each camera looking obliquely downwardly onto the gaming table so as to be able to "see" the side of a stack of chips placed on the table and thus enable the video processing circuitry to determine not only the position of the stack of chips on the table, but also to determine the number of chips and optionally the value of each
25 chip in the stack.

The gaming server 12 may also be connected to the LED display boards 40 of further gaming tables 10, by further signal cables 42. Likewise, the further gaming tables 10 may be equipped with display modules 13 and video cameras 14,
30 connected to the gaming server 12 by signal cables 13b and 14a, respectively. Each table comprises one or more video cameras 14 to detect chips placed on the table,

and to provide to the gaming server position data for a detected betting chip or chips which also identifies the table on which the chip or chips have been placed.

5 The gaming apparatus may comprise one or more additional terminals 10c remote from the gaming tables 10. Each terminal 10c may, for example, be a gaming apparatus such as a fruit machine or slot machine, and may be provided with a selector for the user to select a jackpot game, and an input device for the user to indicate the placing of a wager in a jackpot game. The terminal may further include display means to indicate to a user whether his wager in the jackpot game has been
10 successful.

The gaming apparatus may further comprise one or more mobile gaming devices 11, connected to the gaming server 12 by one or more wireless communication systems 50, schematically represented in Figure 1. Likewise, the one or more
15 mobile gaming devices 11 may be provided with a selector for the user to select a jackpot game, and an input device for the user to indicate the placing of a wager in a jackpot game, and may further include display means to indicate to a user whether his wager in the jackpot game has been successful.

20 **The Gaming Server**

The gaming server 12 and its sub-systems is illustrated in more detail in Figures 2 to 7. Referring to Figure 2, the gaming server 12 includes a game controller 201 which receives inputs and provides outputs for the operation of the main table
25 game.

For example, the game controller 201 may receive inputs from the card dealing shoe S to indicate which cards have been dealt to which player, so that the game controller may determine each player's options in the game, and the eventual winner
30 of each round of the main table game. The time at which each card is dealt may be recorded, in order to provide data as to the speed of progress of the game.

The gaming server 12 also includes a video processing unit 202 which receives inputs from the video cameras 14 mounted above the respective gaming tables 10. The video processing unit 202 includes a position determining module 203 which
5 determines, from the video images, the positions of betting chips placed on each of the gaming tables 10. The position determining module may also serve to determine the value of a betting chip, for example by determining its size, shape, colour and/or patterning.

10 Having determined the position (and optionally the value) of each betting chip on a gaming table, a chip allocation module 204 compares the detected position of each chip with the positions of the betting areas 21ab, 21bb, 21cb, 21db, 21eb and 21fb of the table which are associated with the respective player positions at that table. If the chip allocation module determines that a particular chip is positioned
15 within one of the betting areas 21ab to 21fb associated with a player, data is sent to the game controller to indicate that that player has placed a chip as a bet in the main table game, for example the data may indicate that the player at player position P1 at table number 1 has placed a chip of value 5 units as a bet in the main table game.

20 The chip allocation module 204 also compares the detected position of each chip with the positions of the players' jackpot bet areas 21aj to 21fj, and if the chip allocation module determines that a particular chip is positioned within one of the players' jackpot bet areas 21aj to 21fj, data is sent to the game controller to indicate that that player has placed a chip as a bet in the jackpot game, for example the data
25 may indicate that the player at player position P3 at table number 2 has placed a chip of value 2 units as a bet in the jackpot game.

If the chip allocation module 204 determines that the chip is within the area 32 of the table on which players not seated at the table may place jackpot bets, then data
30 is sent to the game controller identifying the physical position (and optionally the value) of the chip, and indicating that a chip at that position has been placed as a

jackpot bet. If a group of two or more chips has been placed in the area 32 with the chips in touching or overlapping relation or as a stack, the chip allocation module 204 determines how many chips are in the group and determines a mean position for the centre of the group, and passes data to the game controller indicating a position for the group and a total representing either the number of chips in the group or the total value of the chips in the group. For example the data may indicate that at position XY on table number 1 a chip of value 5 units has been placed as a bet in the jackpot game.

The video processing circuitry may be arranged such that it detects not only the position of the chip, but also the colour of the chip, or some other attribute (such as shape or pattern) which is associated with the chip having a particular value in the game. The video processing circuitry may then provide to the game controller a total value represented by the chips placed in a particular betting area, or in a group in the betting area 32.

In addition to bets placed on the gaming table 10 by the seated players at P1 to P6, and others who place their jackpot bets in the area 32, users of remote terminals 10c and mobile gaming devices 11 may place bets on the jackpot game by making appropriate inputs to their respective mobile gaming devices. The remote terminal 10c, or the gaming device 11, then sends a signal to the game controller 12 identifying itself and the specifying amount wagered by the player.

Information received by the game controller 201 concerning the wagers placed in relation to the table game and the jackpot game being played on the table 10 is compiled and stored in a bet data store 210. The bet data store 210 maintains a jackpot game betting table 211 in relation to each jackpot pool, and a main game betting table 212 for each of the gaming tables 10. In some embodiments, the bet data store 210 may maintain a separate jackpot game betting table 211 for each of the gaming tables 10, or may maintain a number of jackpot game betting tables 211 each in respect of a group of gaming tables 10.

In the Main game betting table 212, each of the seated players who places a bet in his respective betting area 21ab - 21eb has the amount of his wager recorded in the main game betting table 212 in association with his table position P1 to P6. A main game betting table 212 may be maintained separately for each of the gaming tables 10 where table games are being offered, particularly if each gaming table 10 offers a different main table game.

In the Jackpot game betting table 211, chips detected in the jackpot bet areas 21aj to 21fj of the respective players are recorded in the jackpot game table in association with the table position P1 to P6 of the player. Where the jackpot game is being played over a plurality of gaming tables, the jackpot game betting table 211 also includes an identifier to identify the gaming table 10 at which the player is seated.

Each player who places a jackpot bet using a mobile gaming device 11 has the amount of his wager recorded in the jackpot game betting table 211 in association with an identifier for his mobile gaming device T1, T2 etc.

Likewise, each player at a remote terminal or slot machine 10c who places a jackpot bet has the amount of his wager recorded in the jackpot game betting table 211 in association with an identifier for his terminal or slot machine S1 etc.

The jackpot game betting table 211 also stores the position and amount data relating to betting chips or groups of betting chips placed in the jackpot bet zone 32, by recording the position of each chip or group of chips, together with its total value. Where the jackpot game is being played over a plurality of gaming tables, the jackpot game betting table 211 also includes an additional column indicating the gaming table 10 on which each of the participating wagers has been placed.

The jackpot game betting table 211 shown in Figure 2 represents jackpot bets

placed by three players seated at a single gaming table, three bets placed in the jackpot bet zone 32, a jackpot bet placed by a user of a mobile gaming device, and a jackpot bet placed from a remote terminal. The jackpot game betting table 211 indicates that the player on table 1 at position P1 has bet two units, the player on
 5 table 1 at position P2 has bet for units, the player on table 1 at position P4 has bet six units, the user of mobile gaming device T1 has bet three units, a player has placed a bet of one unit at position X1Y1 in the jackpot bet zone 32 of table 1, a player has placed a bet of one unit at position X2Y2 in the jackpot bet zone 32 of table 1, a player has placed a bet of two units at position X3Y3 in the jackpot bet
 10 zone 32 of table 1, and the user of a remote terminal S1 has placed a bet of three units. Thus the total amount bet on the jackpot game is 22 units, with eight participating wagers. The three bets placed in the jackpot bet zone 32 may have been placed by the same player, or by up to three different players.

15 Data from the main game betting table 212 is used by the game controller 12 to determine payouts to be made to winning players at the end of each round of the main table game, and to keep track of the amounts wagered, et cetera, for accounting purposes.

20 Concentrating on the jackpot game betting table 211, Figures 3 and 4 show an example of a number of jackpot bets placed on a gaming table 10, and an example of how the corresponding jackpot game betting table 211 may be compiled by the game controller 201 and stored in the bet data store 210 shown in Figure 2.

25 Figure 3 illustrates an example of a plurality of betting chips 60 - 75 placed on the jackpot betting areas of the gaming table 10.

In the jackpot bet area 21aj corresponding to player position P1, two betting chips 60 and 61 are seen.

30 In the jackpot bet area 21bj corresponding to player position P2, four betting chips

63 to 66 are seen. Betting chip 63 has been placed so as to partially overlie betting chip 64.

5

In the jackpot bet zone 32 adjacent jackpot bet area 21bj, a single betting chip 62 is placed.

Likewise, in the jackpot bet zone 32 adjacent jackpot bet area 21cj, a single betting chip 67 is placed.

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In the jackpot bet zone 32 adjacent jackpot bet area 21dj, two betting chips 68 and 69 are placed in touching relationship.

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In the jackpot bet area 21dj corresponding to player position P4, six betting chips 70 to 75 are seen. Betting chip 75 has been placed so as to partially overlie betting chips 73 and 74.

Finally, in the jackpot bet area 21fj corresponding to player position P6, a single betting 76 is seen.

20

Likewise, in the player's betting area 21ab of player P1, there are six chips. In betting area 21bb of player P2 there are two chips, in betting area 21cb of player P3 there are three chips, and in betting area 21db of player P4 there are nine chips, made up of one large chip of face value five units and four chips each of one unit.

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The camera 14 captures an image of the table and the betting chips. Image processing circuitry then scans the image and identifies the positions of each of the betting chips, and may also identify the colour, size and/or shape of a chip and allocate a value to the chip on the basis of that detection.

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The processing circuitry then processes each detected chip sequentially, to determine if the chip is in a player bet area 21ab to 21fb, in a player jackpot zone

212aj to 21fj, or in the jackpot betting zone 32. The processing circuitry then determines, for chips which are in the jackpot betting zone 32, whether the chip is part of a group of betting chips.

5 For example, the processing circuitry scans the image at step 401 and identifies the shapes of betting chips on the gaming table. At step 402, the XY position coordinates of the centres of the identified betting chips are determined.

10 Processing then moves to the chip allocation module 204. In step 403, the coordinates of the centre of chip 60 are compared with coordinate values which represent the jackpot bet zone 32, and coordinate values which represent the individual players' bet areas 21ab to 21fb and the individual players' jackpot bet areas 21aj to 21fj, to determine if the chip 60 is positioned in the jackpot bet zone, in a player jackpot bet area or in a player bet zone.

15 The result of this determination is that the betting chip 60 lies within a player jackpot bet area 21aj. Processing then moves to step 404, where it is determined that player jackpot bet area 21aj is associated with player position P1.

20 At step 405, the chip allocation module 204 sends a signal to the game controller to add 1 to the jackpot wager total for player position P1, and the jackpot bet table 211 is updated.

25 At step 406, the betting chip 60 is flagged as having been processed, and processing moves to step 407 to determine whether any unprocessed chips remain in the captured image. Since all the chips have not yet been processed, processing returns to step 402 to locate the next chip which in this example is chip number 61. This chip is also in the player jackpot bet area 21aj associated with player P1, and thus the result of the processing is that the jackpot game betting table 211 is updated to
30 show a wager total of 2 associated with player P1.

The processing then returns again to step 402, and the next chip is detected. This is chip number 62. At step 403 it is determined that chip number 62 is within the jackpot bet zone 32, and thus processing moves to step 409 to determine whether there is another chip adjacent or overlapping chip number 62.

5

The result of the determination at step 409 is that there is no chip touching or overlapping with chip 62, and processing moves to step 410. The chip allocation module 204 signals to the game controller that a jackpot bet of value 1 unit has been detected at coordinate position X1Y1. The game controller 201 updates the jackpot game betting table 211 to show position X1Y1 and a corresponding jackpot bet of one unit.

10

Processing moves to step 411, betting chip 62 is flagged as having been processed and via steps 407 and 408 processing returns to step 402 to detect the next chip .

15

The next four chips to be processed are the chips 63, 64 , 65 and 66 in player jackpot bet area 21bj, associated with player position P2. Since all of the chips 63 to 66 are detected in the bet area 21bj, it is not necessary to determine whether they are a group or not and thus by a series of iterations through steps 403, 404, 405 and 406 the game controller 201 updates the jackpot game betting table 211 to show a total wager of four units in association with player position P2.

20

The next chip to be processed will be chip 67, the centre of which is within the jackpot bet area 32. In the illustration, betting chip 67 extends partially over the boundary line 31, but since its centre is within the zone 32 it is recognised as a jackpot bet at coordinate position X2Y2, in the manner described above in relation to betting chip 62.

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The next chip to be processed will be chip 68 whose centre is also within the zone 32, and at step 409 the chip allocation module 204 determines that the centre of chip 68 is spaced by a distance equal to or less than the chip diameter R from the

30

centre of chip 69. Processing moves to step 412 where the chip allocation module 204 determines the mean position of the centres of betting chips 68 and 69 and determines that there are two chips in this group.

5 At step 413, chip allocation module 204 then sends a signal to the game controller 201 to indicate the main position X3Y3 of the centres of chips 68 and 69, and the value 2. Game controller 201 then updates the jackpot game betting table 211 to show a wager of two units corresponding to position X3Y3.

10 At step 414 chips 68 and 69 are flagged as having been processed, and the processing returns via steps 407 and 408 to step 402. By repeating the process described above in relation to chip 63, the chip allocation module 204 proceeds to locate the remaining chips 70 to 76 update the jackpot game betting table 211 to show a wager of six units in relation to player position P 4, and a wager of one unit
15 associated with player position P 6.

In a similar fashion, the chips present in the player's betting areas 21ab to 21fb are detected and processed, and these are recorded in the main game betting table 212, the total value of the chips in each of the players' betting areas 21ab to 21fb being
20 recorded in association with the respective player positions P1 to P6. In the example illustrated in Figure 3, the player at position P1 has placed six chips in his bet area 21ab, the player at position P2 has placed two chips in his bet area 21bb, the player at position P3 has placed three chips in his bet area 21cb and the player at position P4 has placed a total of nine chips in his betting area 21db, made up of
25 a chip of value 5 and four chips of value 1.

At this point, step 407 determines that there are no further unprocessed chips and the process then ends.

30 The result of detecting the chips illustrated in Figure 3 is the jackpot game betting table 211 and the main game betting table 212 shown in Figure 2.

When all of the chips have been detected and allocated, and recorded in the jackpot game betting table 211 and the main game betting table 212, play proceeds in the main game, winners and losers are determined, and the wagers are resolved.

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The information in the jackpot game betting table 211 may be retrieved by the game controller 201 and sent to the output unit 218 to be displayed on the display modules 13 associated with the tables 10. The display module 13 at each table may, when jackpot bets have been detected, display as a graphical and/or textual representation a list of the players who have placed jackpot wagers placed and their corresponding amounts. This may be done by displaying on the display 13a a graphical representation of the gaming table and the betting chips thereon, optionally overlaid with captions indicating the players who placed each of the bets. Jackpot bets placed in the communal jackpot betting area 32 may be assigned captions such as "Mystery player 1" or "Mystery player 2", the names being allocated on the basis of the timing of the placing of the bet or the position of the chips in the betting area 32. Jackpot bets placed from remote terminals may be represented by images of chips placed as jackpot bets in the communal betting area 32 and may be assigned captions for example "Slot 1", "Slot 2". Jackpot bets placed from mobile gaming devices 11 may likewise be represented as jackpot bets in the communal betting area 32, and may be assigned captions for example "Mobile 1", "Mobile 2".

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Alternatively, the display module 13 may simply display a list correlating the player positions and jackpot bets placed, displaying a caption such as "Mystery Player 1" in relation to each of the jackpot bets located in the area 32, such as "Slot 1" in relation to each of the jackpot bets placed from a remote terminal, and such as "Mobile 1" in relation to each of the jackpot bets placed from a mobile gaming apparatus.

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In a further alternative, the display module 13 may display a graphical representation of the table showing the disposition of chips on the playing surface,

and in addition may display a listing of the jackpot bets placed from remote terminals 10 and/or mobile devices 11.

Where a jackpot game is being played at multiple tables, the display module at each
5 table may sequentially display graphical representations of each of the tables, or may display a composite graphical display showing all of the tables and the wagers in the jackpot game placed thereon.

In a further alternative, the display module may simply display the total number of
10 jackpot bets placed in the particular jackpot game, and/or the total amount wagered in those jackpot bets.

Information from the jackpot game betting table 211 concerning the wagers placed in the jackpot game is sent to the jackpot controller 213, which includes an
15 allocation module 214, a result module 215, a player selection module 216 and an output module 217.

The allocation module 214 firstly allocates portions of the jackpot wagers to one or more jackpot game bonus pools, and maintains a running total for the or each bonus
20 pool. The allocation module 214 is schematically illustrated in Figure 5. A receiver unit 214a receives data concerning the amount of each jackpot bet. Arithmetic unit 214b then calculates a portion of the jackpot bet amount to be allocated to bonus pool number 1 and adds it to the current total of bonus pool 1, which is then stored in totaliser 214c. A further percentage of the jackpot bet amount is calculated in
25 arithmetic unit 214d and is added to the current total of bonus pool 2, which is stored in totaliser 214e.

The result module 215 then determines whether or not the jackpot has been won during this round of the main table game. The result module 215 is illustrated in
30 schematic detail in Figure 6. In this embodiment, the result module 215 includes a random number generating unit 215a which has a random number generator 215b

and a memory 215c for storing ranges of numbers. The memory 215c stores a range corresponding to each of the bonus pools. The random number generator 215b operated to generate a random number N1 for bonus pool 1, and a random number N2 for bonus pool 2. The random numbers N1, N2 are chosen to be within the respective predetermined ranges, stored in the memory 215c. The random number N1 is then compared, in a comparator 215d, with the current bonus pool total for bonus pool 1, and the result of this comparison is passed to a determining unit 215e.

If the current total for bonus pool 1 is greater than or equal to the random number N1, the determining unit 215e outputs a signal to the player selection module 216 indicating that the bonus pool has been won. If the current bonus pool total is less than the random number N1, the determining unit 215e outputs a signal to the output module 217 indicating that the bonus pool has not been won, and updates the memory 215c to reduce the permissible range of values for N1 at the next round of the main table game. Likewise, for bonus pool 2 the comparator 215d compares the random number N2 with the total for bonus pool 2 and determining unit 215e determines whether bonus pool 2 has been won or not, and either outputs a win indication to the player selection module 216, or outputs a no-win indication to the output module 217 and updates the range stored in the memory 215c in relation to bonus pool 2.

If the output module 217 receives "no-win" signals in respect of all of the bonus pools, indicating that none of the bonus pools have been won, the output module 217 notifies the game controller 201, which may then send signals to display modules 13 and the display boards 40 to indicate that no jackpot has been awarded. The display boards 40 may be illuminated, for example by providing flashing illumination round the jackpot bets to indicate that these are losing bets and should be cleared from the table. The main casino table game can then proceed to its next round.

If the determining unit 215 determines that one or more of the bonus pools has been

won, a "win" signal in respect of each of the bonus pools won is passed to the player selection module 216, which determines the winning player for each bonus pool. The player selection module 216 is schematically illustrated in Figure 8, and Figure 9 shows an example of a probability table used for selecting the winner.

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When a win indication is received, the player selection module 216 generates the probability table, illustrated in Figure 9. Adder 216a of the player selection module first determines the total value Q of the bets placed in the jackpot game at this round of the game, and table generator 216b constructs a probability table having Q rows.

10 In the present example illustrated in figure 9, the probability table has 22 rows to correspond to the total of the wagers recorded in the jackpot game betting table 211 of Figure 2. In the probability table illustrated in Figure 9, the "player position" information relates only to one gaming table, one remote terminal S1 and to a single mobile gaming device TI. Where the jackpot game is being played over a number

15 of different gaming tables, then the "player position" information will indicate not only the position P1, P2 etc of a seated player or the XY coordinates of the detected wager, but also will indicate the gaming table 10 at which the player is seated or on which the wager has been detected. Likewise, when the jackpot game is also being played by users of one or more remote terminals 10c such as slot machines, then

20 the "player position" information will indicate the identity S1 etc of each slot machine or remote terminal, and the amount wagered by the player at that terminal. Assigning unit 216c then assigns player identifications to the rows of the probability table, in accordance with the value of the jackpot bet placed by each respective player. For example, a player who has placed a jackpot bet of four units

25 will be assigned to four rows in the probability table. The assigning unit 216c may randomly assign the player identifications to the rows in the probability table, provided that the correct number of rows are allocated to each player. Alternatively, the rows may be assigned in blocks in accordance with the value of each player's wager. In the example illustrated in Figure 9, a total of 22 units has

30 been wagered on the jackpot game, and thus the probability table has 22 rows. The player positions are distributed randomly amongst the rows 1 to 22. If the rows of

the probability table were to be assigned in blocks, then because the player at position P1 has made a jackpot bet of two units, the assigning unit 216c could simply assign rows 1 and 2 to player P1, rows 3 to 6 to player P2, and so on. Using this method of allocation, rows in the probability table may be allocated sequentially as betting chips are detected in the jackpot betting zones, and/or as remote or mobile gaming machines are used to place jackpot bets. The probability table may thus be prepared for each round of the main table game in advance of, or at the same time as, the step of determining whether the jackpot is or is not won. Processing time is thus saved.

In the present example, the player seated at table position P1 has placed a wager of two chips on the jackpot game, and thus player position P1 is randomly assigned two of the rows of the jackpot table by the assigning unit 216c. In this example, rows 3 and 6 of the jackpot table are assigned to player P1. Likewise, the player at position P4 has placed six chips on the jackpot bet area 21dj, and thus is allocated six rows (rows 2, 4, 8, 13 and 21) in the probability table. The player at the remote terminal 10c identified as S1 placed a wager of three units in the jackpot game, and rows 7, 10 and 20 of the probability table are allocated to the player position S1. The assigning unit 216c continues until every row of the probability table is assigned to a player.

The player selection module 216 includes a random number generator 216d, which receives from the adder 216a the value Q, and generates a random number L in the range from 1 to Q, for each bonus pool which has been won. The random number L is sent to a determining unit 216e, which determines that the player identified at row L of the probability table is the winning player for that bonus pool.

The output module 217 then sends to the game controller 201 the identity data of the winning player (or the table identifier and XY coordinates of the winning bet), and optionally also the total of the jackpot bonus pool which the player has won.

Figure 7 schematically illustrates the game controller 201, which includes a gaming module 201a which receives inputs and makes outputs relating to the main casino table game. The game controller 201 also includes a jackpot win sequence unit 201b comprising a receiver 201c, a display compiler 201d, a memory 201e and an output unit 201f.

When the details of the jackpot winning player or players are received from the output module 217, the receiver 201c receives the data and passes it to the display compiler 201d which, on the basis of the winner's identity (the player position and table number) or the coordinates of the winning wager (the XY coordinates and the table number if applicable) or the identity of the mobile gaming device or remote terminal, obtains from the memory 201e one or more animation sequences, static displays, photographs, or other data which will be shown on the display modules 13, and optionally also animated sequences for display on the display boards 40 of the gaming tables 10, and compiles a display sequence. In a preferred embodiment, the display sequence will consist of two parts, an initial generic display indicating that the jackpot has been awarded, and a final specific display identifying the winning player or players. When the display compiler 201d has assembled the content for display on the display modules 13 and by the display boards 40 of the gaming tables 10, the content is passed to the output unit 201f. The memory 201e of the jackpot win sequence unit 201b may include a number of pre-defined display sequence images and animations, as well as images or video clips of players, which may also be accompanied by sounds. The display compiler 201d may search in the memory 201e for an image or video clip associated with the winner, and include this video sequence or image in the assembled content.

The output unit 201f then sends output signals to the display modules 13 and the display boards 40 of the tables 10, to indicate that the jackpot has been won, and to indicate the winning player.

The winning player may be indicated by LEDs 41 from the display board 40

illuminating all or part of the player's jackpot bet area 21aj - 21fj if the jackpot has been won by a player seated at the gaming table 10. If the jackpot is won by a player who has placed his jackpot wager in the jackpot zone 32, the game controller 201 may output signals to the LEDs 41 surrounding the winning jackpot bet so that the winning jackpot bet is indicated, for example by being encircled by lights, or by having an arrow point at the winning chip or chips, or by some other display. The display may be static or may be animated.

If the winning player is a user of a mobile gaming device 11 or a mobile terminal 10c, display content will be sent from the gaming server 12 to the mobile gaming device 11 or terminal 10c, for display to the user. The display content may be both audible and visible. Additionally, the display modules 13 may be caused to display an indication that the jackpot has been won, and/or an indication of the winning player. These indications may be simultaneous or sequential, for example the display may firstly indicate that the jackpot has been won, and subsequently indicate the identity, location or playing position of the winning player.

When a jackpot has been won, the running total of the relevant bonus pool is reduced by the amount awarded to the winner, losing jackpot bets are cleared from the table or debited from the account of the mobile gaming device user 11, and the next round of the main table game commences. At this point players are invited to make further jackpot bets by placing chips on the jackpot betting areas or via mobile gaming devices, and the cycle is repeated.

Alternative embodiments

In the illustrated embodiment shown in figure 1, a card dealing shoe S is used in the main game being played on the casino table, the shoe S being linked to the gaming server 12 to supply information concerning the main casino game. In alternate embodiments, the gaming table 10 may be used to play roulette or Sic Bo, and the card shoe S will then be replaced by the appropriate roulette wheel or Sic

Bo dice shaker apparatus, again linked to the gaming server 12 to provide game information to the gaming server for play in the main casino game. In addition to the customary betting layouts for roulette or Sic Bo, one or more betting areas will be provided for patrons to place jackpot bets. As described in the principal embodiment, where a table has a number of fixed seating positions for patrons, then each patron may have his own jackpot betting area and a further communal jackpot betting area may be delineated so that players not seated at the table may place jackpot bets by placing chips in the communal jackpot betting area.

In a further alternative, a card game such as baccarat, blackjack or poker may be provided as the main casino game on the table 10, with a live dealer handling the cards. Each player may have his own jackpot betting area and a further communal jackpot betting area may be delineated so that players not seated at the table may place jackpot bets by placing chips in the communal jackpot betting area. The dealer may be provided with an information input device to provide information to the gaming server 12 concerning the main casino game. It is further foreseen that the gaming table 10 may be a craps table, and may have a jackpot bet zone provided for patrons to place jackpot bets in addition to the usual betting areas provided.

The gaming tables in the illustrated embodiment are described as having a baize playing surface. While this is preferred for casino games involving cards, it is foreseen that the playing surface may be of any material, provided that the illumination from the display board beneath the playing surface is visible to the players. The playing surface may be a sheet of plastics material or glass, or may be a woven fabric or a felt.

As an alternative to the video camera and image processing system used to locate betting chips on the gaming table, the display board 40 may include, as well as LEDs 41, one or more sensors to detect the position of a chip placed on the table. These sensors may, for example, comprise an array of photosensitive elements arranged beneath the areas where chips may be placed, and which detect the

presence of chips by the shadow produced at a number of the photo sensors when a chip is placed on the baize surface. The table may be strongly illuminated from above using either visible light or invisible light such as ultraviolet or infrared light, so that placing a chip on the baize causes a strong shadow on the sensor or sensors beneath the chip. By processing the returns from the array of sensors, the positions of chips placed on the baize may be determined and fed to the game controller 201 for processing substantially in the manner described above..

In a further alternative, the table may be illuminated from beneath the baize, for example by LEDs 40, and an array of photosensitive detectors may be integrated into the display board 40 to detect light reflected back from the undersides of the betting chips placed on the baize surface.

In a yet further alternative embodiment, the individual betting chips may be equipped with RFID devices, which can be sensed by an RFID detector array mounted on or adjacent the display board 40 in order to establish the position of the chip on the table, whereupon processing will ensue to determine whether the chip is in a player's betting area 21ab - 21fb, a player's jackpot area 21aj - 21fj, or in the jackpot zone 32. The placing of chips on the table may be determined by any suitable detection devices, such as capacitive or weight sensors provided in the table, provided that the detection devices are able to give an output indicating the position of the chip on the table and optionally assign a value to the chip.

In any of the above embodiments, the betting chips may be removed from the gaming table 10 by the table operator at any point after the positions and optionally the values of the betting chips have been captured and recorded in the bet data store 210. The game controller 201 may send outputs to the display boards 40 of the gaming tables 10 in order to display images at the positions in which betting chips were placed, optionally indicating the value of the bet placed at that position. The image may be an image of the chips which were detected at that position, or may be an image or avatar representing the player who placed the chips at that position,

captured either by the video camera 14 or stored in a memory, for example the memory 201e, in the gaming server 12. The images may be static or animated.

5 The display board 40 may extend under the entire playing surface of the table 10, and data from the game controller relating to the main table game may be used to display animations, images or data in the individual player areas of the table. For example, a player who is a winner in the main table game may be rewarded with an animation displayed on his player area 21ac - 21fc. In a further alternative, the display board 40 may be used for example to display on the players area 21ac - 21fc
10 an amount of winnings made by the player in that round, to assist the dealer in making accurate payouts.

In a further alternative, the gaming table 10 may be a simple gaming table without any display capability, and the identification of winning bets may be made by
15 identifying the winning bet on a display shown on the display module 13 rather than by a selective illumination of part or parts of the gaming table.

In the embodiment illustrated in Figure 10, a gaming table is illustrated similar to the gaming table 10 of Figure 1. Like components illustrated in Figure 10 are given
20 the same reference numerals as in Figure 1. In addition to the overhead video camera 14, the arrangement in Figure 10 includes a pair of sideways-looking cameras 14s positioned at opposite ends of the gaming table, so as to be able to look across the gaming table. Three or more cameras 14s may be used to provide full coverage of the table, so that a stack of gaming chips is not obscured from all of the
25 cameras by another stack of gaming chips. An image of a stack of gaming chips 500 placed in the jackpot bet area 21fj of player position P6 will be captured by the video cameras 14 and 14s, and by processing the captured video images the number and also optionally the values of the chips in the stack 500 may be determined in order to assign a bet amount to the wager placed by the player at position P6. Once
30 all the video images have been processed to detect and assign bet values to stacks of chips placed on the table either in individual players' betting areas or in the

communal jackpot betting zone 32, then the processing continues as before to determine whether a jackpot has been won, and to determine the winner.

Claims:

1. Gaming apparatus for providing a live casino table game wherein bets are placed by players placing gaming chips on a gaming table in predefined areas of the table, the apparatus comprising:

image capture and processing apparatus for:

detecting the positions of gaming chips placed on the gaming table; and
generating, in response to that detection, a signal including position data relating to each detected gaming chip;

a processor; and

a memory device;

wherein the processor is operable to:

receive said signal from the image capture and processing apparatus;

determine from said position data whether the detected gaming chip is within a predefined area of the gaming table; and
store in said memory device a correlation between the position data and the number of gaming chips detected within that predefined area.

2. Gaming apparatus according to claim 1, wherein the sensor apparatus is adapted to detect the position of a gaming chip and to identify an assigned value for the gaming chip on the basis of its shape, size, pattern or colour, and wherein the processor is operable to store in the memory device a correlation between the position data and the assigned values of detected gaming chips.

3. Gaming apparatus according to claim 1 or 2, wherein the gaming table includes a plurality of predefined areas, each of the predefined areas of the table being associated with a respective player, and wherein the processor is operable to store in the memory device a correlation between a player's identity and the number or assigned value of gaming chips detected within the predefined area associated with that player.

4. Gaming apparatus for providing a live casino table game and an auxiliary game, the apparatus comprising:

- 5 a. a gaming table having a playing surface including a first table area (21ac-21fc) for playing the live table game, and a second table area (32) on which a plurality of betting chips may be placed;
- b. a detector for detecting a betting chip placed on the playing surface within the second table area, and outputting position data relating to the location on the playing surface of the detected betting chip;
- 10 c. a memory for storing said position data relating to respective detected betting chips;
- d. a random number generator for generating random numbers;
- e. a processor for selecting one of said detected betting chips on the basis of a generated random number; and
- 15 f. display means for indicating the position of the selected betting chip, on the basis of said stored position data.

5. Gaming apparatus for providing a live casino table game and an auxiliary game wherein bets are placed by players placing gaming chips on a gaming table, the apparatus comprising:

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a gaming table including:

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- a. a first table area (21ac-21fc) for playing the table game, and
- b. a second table area (32) adapted to receive a plurality of gaming chips representing a plurality of bets;
- 25 c. sensor apparatus (14, 202) for:
 - i. detecting the positions of gaming chips placed on the gaming table; and
 - ii. generating, in response to that detection, a signal including position data relating to each detected gaming
- 30 d. a display for indicating the detected position of at least one detected

betting chip;

the apparatus further comprising:

a game computer in communication with the sensors and with the display, the game computer including processing means (201, 202) and a memory device (210), wherein;

the processing means (201, 202) is operable to:

receive said signal from the sensor apparatus (14, 202);

determine from said position data whether the detected gaming chip is within said second table area; and

store in said memory device (210) the position data of gaming chips detected within the second table area (32);

a random number generator (216d) for generating random number data;

a processor (216e) for selecting the position of a detected gaming chip from among the stored positions on the basis of the generated random number data; and

a controller (217, 201, 218) for coordinating activation of the display in a predetermined display sequence in response to said determination, to indicate the selected position.

6. Gaming apparatus according to claim 5, comprising a plurality of gaming tables for playing a plurality of base live casino table games wherein bets are placed by players positioning gaming chips on a table, each gaming table including:

a. a first table area (21ac-21fc) for playing the table game; and

b. a second table area (32) adapted to receive a plurality of gaming chips representing a plurality of side bets;

c. sensor apparatus (14, 202) for:

detecting the positions of gaming chips placed on the gaming table; and

generating, in response to that detection, a signal including table identification data and position data relating to each detected gaming

chip; and

- d. a display for displaying data indicating the detected position of at least one detected betting chip;

and wherein the gaming computer is in communication with the sensors and with the indicators on said plurality of gaming tables.

7. Gaming apparatus according to claim 4 or claim 5, further including a controller (213) for determining, on the basis of a random number generated by a random number generator, whether a detected gaming chip position is to be selected.

8. Gaming apparatus according to any of claims 4 to 7 in which the second table area (32) comprises an area larger than the size of a betting chip such that a plurality of betting chips may be placed in a plurality of different locations within the second table area.

9. Gaming apparatus according to any of claims 4 to 8 in which the table surface comprises more than one second table area, each second table area being adapted to accommodate a plurality of betting chips on the playing surface

10. Gaming apparatus according to any of claims 4 to 9 in which the detector is operable to detect a betting chip placed anywhere in a second table area.

11. Gaming apparatus according to any of claims 4 to 10 in which the detector is an overhead camera.

12. Gaming apparatus according to any of claims 4 to 10, in which the detector is an array of sensors on or beneath the playing surface.

13. Gaming apparatus according to any of claims 4 to 12, in which the display comprises an illuminated display means visible through the table playing surface.

14. Gaming apparatus according to claim 13, in which the illuminated display means comprises an LED display board mounted below the table surface

5 15. Gaming apparatus according to claim 13, in which the illuminated display means comprises a projector mounted below table surface

16. Gaming apparatus according to any of claims 4 to 12, in which the illuminated display means comprises an overhead projector.

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17. Gaming apparatus according to claim 16, in which the overhead projector is a scanning laser.

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18. Gaming apparatus according to claim 16 or claim 17, in which the overhead projector projects non-visible light which causes the table playing surface, or marks on the playing surface, to fluoresce so as to provide a visible indication.

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19. Gaming apparatus according to any of claims 13 to 18 in which the illuminated display provides a visible delineation of the second table area or areas on the playing surface.

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20. Gaming apparatus according to any of claims 4 to 19, in which the processor is operable to cause the display means to make a visual display at the location of a detected betting chip.

21. Gaming apparatus according to any of claims 4 to 20 in which the detector is operable to detect a characteristic of the betting chip such as size, colour, shape

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22. Gaming apparatus according to claim 21, in which the memory is adapted to store data relating to the detected characteristic of the betting chip in

association with the position data of the betting chip

23. Gaming apparatus according to claim 6, comprising first and second random number generating means and first and second determining means, in which:

the first random number generating means is adapted to generate a first random number within a first range,

the first determining means is operable to compare the first random number with a predetermined value to determine whether a jackpot has been won, and

second random number generating means for determining a second random number within a second range in the event that the first determining means determines that the jackpot has been won;

second determining means for selecting a winning player on the basis of the second random number

24. Gaming apparatus according to any of claims 4 to 21, in which the memory for storing said position data relating to the detected betting chips comprises a probability table having a number of rows, each row associated with a detected position, and the random number generator is operable to generate a random number in a range equal to the number of rows in the probability table.

25. Gaming apparatus according to claim 24, in which each detected position is associated with a number of rows in the probability table.

26. Gaming apparatus according to claim 25, further including processor means for adding the total value represented by detected betting chips at a position, and generating a probability table having a number of rows equal to the total value of the detected betting chips.

27. Gaming apparatus according to claim 26, in which the number of rows of the probability table associated with a particular position is equal to the value of

chips detected at that position.

28. Gaming apparatus according to any of claims 4 to 27, further including one or more remote gaming devices operable to send signals to the processor which identify the remote gaming device, and wherein the processor is operable to store in the memory the identification data of the remote gaming device as position data.

29. Gaming apparatus according to claim 28 wherein the remote gaming device is a mobile gaming apparatus, or a remote fixed gaming device or terminal.

30. Gaming apparatus according to claim 28 or 29, wherein:
said one or more remote gaming devices are operable to send signals to the processor which identify the remote gaming device and a wager value;
wherein the memory for storing position data comprises a probability table having a number of rows, each row associated with respective position data;
the random number generator is operable to generate a random number in a range equal to the number of rows in the probability table; and
the processor is operable to store in the probability table the identification data of the remote gaming device as position data, in association with a number of rows of the probability table equal to said wager value.

31. Gaming apparatus substantially as described herein with reference to Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, Figure 7, Figure 8, Figure 9 or Figure 10 of the accompanying drawings.

32. A method of providing an auxiliary jackpot game at one or more live gaming tables, substantially as described herein.



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Claims searched: 1-3

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Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-3.	WO 01/86604 A1 (ENGELS) Please see abstract, drawings, the summary of invention and page 9, line 3 to end of description.
X	1-3.	US 2005/0272501 A1 (TRAN et al.) Please see abstract, drawings and paragraphs 100-108 in particular.
X	1-3.	WO 2014/118497 A1 (TCS JOHN HUXLEY) Please see abstract, drawings and page 13, line 20 to page 14, line 13; page 26, lines 10-15 & page 28, line 25 to page 29, line 12.
X	1-3.	GB 2382034 A (DAVIS) Please see abstract, drawings, page 2, lines 6-34 & page 5, line 26 to page 6, line 36.
X	1-3.	US 2009/0069090 A1 (MOSER et al.) Please see abstract, drawings and paragraphs 281 & 282 in particular.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

Worldwide search of patent documents classified in the following areas of the IPC

A63F; G07F

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC, TXTE, INSPEC, XPSRNG, XPRD, XPMISC, XPI3E, XPIEE, XPIPCOM, NPL



International Classification:

Subclass	Subgroup	Valid From
G07F	0017/32	01/01/2006
A63F	0003/00	01/01/2006