[0007]

Furthermore, fraud on a game table is so sophisticated that it is not possible to find, for example, fraud made in a sophisticated way of betting by, for example, simply detecting that the amount won on a certain game table is large with a camera, thus posing a new problem.

[0008]

Moreover, a dealer needs to collect game tokens and distribute game tokens as a reward placed on a game table according to win-loss results. Assume that this operation is determined by image analysis. In this case, because each game token (chip) has a complex design, it is not possible with any existing practical image analysis technique to determine whether the dealer has performed correct distribution for a reward when distributing chips as a reward corresponding to bet chips, thus resulting in the problem of insufficient prevention of mishandling.

Solution to Problem

[0008a]

An aspect of the present invention provides a table game management system comprising: a measurement device, wherein the measurement device is configured to sense features of game tokens placed on a game table and that each has a multilayer structure in appearance having (a) a colored layer and (b) white or light-colored layers, each layer of the multilayer structure being arranged alternately, thereby forming a striped pattern on a side surface of the respective game token in an axial stacking direction of the layers of the respective game token; a win-loss result determining device; and a management control device; wherein, for each of one or more games played at the game table: the win-loss result determining device is configured to

determine a respective win-loss result of the respective game; and the management control device is configured to: identify and store positions, types, and numbers of the game tokens placed on the game table respectively by each of one or more game participants for the respective game by using a measurement result obtained by the measurement device in the respective game, wherein, to identify the game tokens, the management control device is further configured to: recognize respective ones of the colored layers of the game tokens placed on the game table as separate respective ones of the game tokens; and for each recognized one of the game tokens, recognize a respective type of the game token based on a respective color of the colored layer, different ones of the game tokens being recognized as being different types based on the respective colors of their respective colored layers being different; and perform a casino-side balance calculation associated with the game table for the respective game based on: the respective win-loss result determined for the respective game; and the positions, types, and number of game tokens identified, for the respective game, as having been placed by each of the one or more game participants.

[0008b]

Another aspect of the present invention provides a table game management system comprising: a sensor configured to sense game tokens that are placed on a game table and that each has a multilayer structure in appearance, the multilayer structure including at least one white or light-colored layer and a colored layer that is darker than the at least one white or light-colored layer, thereby forming a striped pattern on a side surface of the respective game token in an axial stacking direction of the layers of the respective game token; and at least one processor, wherein, for each of one or more games

played at the game table, the at least one processor is configured to: determine a win-loss result of the respective game; identify respective positions, types, and numbers of the game tokens placed on the game table respectively by each of one or more game participants based on output of the sensor obtained by the at least one processor in the respective game, wherein, to identify the respective positions, types, and numbers of the game tokens, the at least one processor is further configured to, for each identified one of the game tokens, recognize a respective type of the game token based on a respective color of the colored layer of the respective game token, different ones of the game tokens being recognized as being different types based on the respective colors of their respective colored layers being different; and perform a casino-side balance calculation associated with the game table for the respective game based on: (a) the determined win-loss result of the respective game; and (b) the positions, types, and numbers of game tokens identified for the respective game.

[0008c]

Another aspect of the present invention provides an inspection apparatus for inspection of a game token of a plurality of game tokens, the inspection apparatus comprising: a path including an inlet and an outlet through which a game token is allowed to pass; at least one sensor; and at least one processor, wherein the at least one processor is configured to: based on output of the at least one sensor: determine a color of a striped pattern on a side surface of the game token in an axial stacking direction of the game token as the game token moves along the path, where the game token has a multilayer structure in appearance, the multilayer structure including at least one white or light-colored layer and a colored layer that is darker than the at least one white or light-colored layer,

thereby forming a striped pattern on a side surface of the game token in a stacking direction of the layers of the game token, wherein the color is of the colored layer, the color of the colored layer differing between different ones of the plurality of game tokens; and read a print on a surface of the game token sensed from a direction perpendicular to the path as the game token moves along the path; identify a type of the game token based on the determined color, which distinguishes the type from types of other ones of the plurality of game tokens whose respective colors of their respective colored layers differ from the determined color; identify the type of the game token based on the read print; and determine whether the two identifications of the type of the game token match each other.+

[0008d]

Another aspect of the present invention provides a game token comprising a multilayer structure in appearance having (a) a colored layer and (b) white or light-colored layers that are arranged alternately with the colored layer, thereby forming a striped pattern on a side surface of the game token in a stacking direction of the layers of the game token, wherein a type of the game token is identifiable based on a color of the colored layer.

[0009]

A table game management system as disclosed includes a card distributor that determines and displays a win-loss result on each game on a game table, a measurement device that measures types and number of game tokens

A game token as disclosed includes an arrangement having plastic layers with a plurality of different colors stacked on each other, with a colored layer being provided at least intermediately, and white layers or light-colored layers being stacked on two sides of the colored layer, so as to form a striped pattern on a side surface in a stacking direction and allow identification of the type of game token according to the colored layer.

[0012]

In addition, the game token has a print indicating the type of game token provided on a surface of the white layer or the light-colored layer, and a transparent layer is provided on an outermost layer, with the layers being bonded to each other by thermal compression to form at least a five-layer structure.

[0013]

Furthermore, the game token may be configured such that a mark formed by UV ink or carbon black ink is provided on a surface of the white layer or the light-colored layer, that the transparent layer on the outermost layer is embossed, that R chamfering is provided to an edge of the transparent layer on the outermost layer, that the colored layer includes a plurality of layers, or that the colored layer incorporates an RFID.

[0014]

An inspection apparatus that inspects a game token as disclosed includes a path including an inlet and an outlet through which a game token is allowed to pass in a radial direction, a chip type determination device that determines the color of a striped pattern on a side surface of a game token in a stacking direction by shooting the game token passing through the path, a mark reader that reads a mark formed by UV ink or carbon black ink and provided on a surface of a passing game token, a print inspection device that reads a print indicating a type, which is provided on a surface of a game token, from a direction perpendicular to the path, and a control device for the overall apparatus, wherein the control device is configured to inspect whether a chip type determined by the chip type determination device matches information of the print indicating the type obtained from the print inspection device.

Advantageous Effects of Invention

[0015]

A system according to embodiments of the present invention allows determination of the number of game tokens (chips) by image analysis even if a large number of chips are stacked on each other, and can grasp the total amount of game tokens stacked relatively high on the basis of the position and the colors.

Brief Description of Drawings

CLAIMS

1. A table game management system comprising:

a measurement device, wherein the measurement device is configured to sense features of game tokens placed on a game table and that each has a multilayer structure in appearance having (a) a colored layer and (b) white or light-colored layers, each layer of the multilayer structure being arranged alternately, thereby forming a striped pattern on a side surface of the respective game token in an axial stacking direction of the layers of the respective game token;

a win-loss result determining device; and

a management control device;

wherein, for each of one or more games played at the game table:

the win-loss determining device is configured to determine a respective win-loss result of the respective game; and

the management control device is configured to:

identify and store positions, types, and numbers of the game tokens placed on the game table respectively by each of one or more game participants for the respective game by using a measurement result obtained by the measurement device in the respective game, wherein, to identify the game tokens, the management control device is further configured to:

recognize respective ones of the colored layers of the game tokens placed on the game table as separate respective ones of the game tokens; and

for each recognized one of the game tokens, recognize a respective type of the game token based on a respective color of the colored layer, different ones of the game tokens being recognized as being different types based on the respective colors of their respective colored layers being different; and

perform a casino-side balance calculation associated with the game table for the respective game based on:

the respective win-loss result determined for the respective game; and

the positions, types, and number of game tokens identified, for the respective game, as having been placed by each of the one or more game participants.

2. A table game management system comprising:

a sensor configured to sense game tokens that are placed on a game table and that each has a multilayer structure in appearance, the multilayer structure including at least one white or light-colored layer and a colored layer that is darker

than the at least one white or light-colored layer, thereby forming a striped pattern on a side surface of the respective game token in an axial stacking direction of the layers of the respective game token; and

at least one processor, wherein, for each of one or more games played at the game table, the at least one processor is configured to:

determine a win-loss result of the respective game;

identify respective positions, types, and numbers of the game tokens placed on the game table respectively by each of one or more game participants based on output of the sensor obtained by the at least one processor in the respective game, wherein, to identify the respective positions, types, and numbers of the game tokens, the at least one processor is further configured to, for each identified one of the game tokens, recognize a respective type of the game token based on a respective color of the colored layer of the respective game token, different ones of the game tokens being recognized as being different types based on the respective colors of their respective colored layers being different; and

perform a casino-side balance calculation associated with the game table for the respective game based on:

(a) the determined win-loss result of the

respective game; and

(b) the positions, types, and numbers of game tokens identified for the respective game.

3. The table game management system according to claim 2, wherein the at least one processor that is includes a processor integrated in a card distributor and configured to determine the win-loss result of the respective game.

4. The table game management system according to claim 2, wherein, to determine the number of game tokens, the at least one processor is further configured to measure a number of colored layers or white or light-colored layers of the game tokens placed by each of the one or more game participants, and wherein the casino-side balance calculation on the game table for each game is configured to verify game token payouts based on the number and the type of the game tokens associated with a particular one of the one or more game participants and based on a determination associated with whether the particular participant was the winner or the loser.

5. The table game management system according to claim 2, further comprising a chip tray configured to hold the game tokens for each type, wherein the at least one processor is configured to:

measure types and numbers of game tokes on the chip tray to measure a total amount of the game tokens held by the chip tray; and

verify game token payouts from the chip tray based on the numbers and the types of game tokens held by the chip tray and the identified numbers and types of the game tokens on the game table.

6. The table game management system according to claim 2, wherein a surface of the white or light-colored layer includes a mark, the mark includes ultraviolet (UV) ink or carbon black ink.

7. The table game management system according to claim 2, wherein the colored layer comprises a plurality of adjoining colored layers.

8. The table game management system according to claim 2, wherein the colored layer incorporates a radio-frequency identification (RFID) tag.

9. The table game management system according to claim 2, wherein the at least one processor is configured to determine (a) a number of the colored layers, (b) a number of the white or light-colored layers, or a combination thereof, to determine

the number of the game tokens.

10. The table game management system according to claim 2, wherein the at least one processor is configured to:
identify individual game tokens placed on the game table based on a corresponding striped pattern of each game token;
locate the colored layer of the identified individual game tokens based on the white or light-colored layers of the striped pattern; and
identify the type of color of the colored layer of each game token.

11. The table game management system according to claim 2, further comprising:

a chip tray configured to store a plurality of game tokens; and

a radio-frequency identification (RFID) reader proximate to the chip tray and configured to determine numbers and types of the plurality of game tokens stored by the chip tray based on RFID tags in the plurality of game tokens,

wherein the at least one processor is configured to verify game token payouts from the chip tray based on the numbers and the types of the game tokens stored by the chip tray determined and by the RFID reader, the numbers and the types of the game tokens on the game table determined based on the identified

colored layers, and a determination associated with whether each participant in each game is a winner or a loser.

12. The table game management system according to claim 2, wherein each of the game tokens the at least one processor is configured to identify based on the colored layers of the game tokens comprises:

a first layer, which is a first transparent layer;

a second layer, which is a first of the white or light-colored layers and includes one or more marks, wherein the one or more marks comprises ultraviolet (UV) ink or carbon black ink;

a third layer, which is the colored layer, the colored layer defining a cavity and including radio-frequency identification (RFID) device positioned within the cavity;

a fourth layer, which is a second of the white or light-colored layers; and

a fifth layer, which is a second transparent layer, wherein:

the second layer is positioned between the first and third layers,

the third layer is positioned between the second and fourth layers, and

the fourth layer is positioned between the third and fifth layers.

13. The table game management system according to claim 2, wherein the at least one processor is configured to identify the colored layer based on a contrast of the colored layer from its surrounding white or light-colored layers.

14. The table game management system according to claim 13, wherein the at least one processor is configured to determine the number of game tokens placed on the game table by counting a number of the colored layers of the game tokens.

15. The table game management system according to claim 2, wherein, for each of at least one of the game tokens whose colored layers the at least one processor is configured to identify, a print indicating the type of the respective game token is provided on a surface of the white or light-colored layer, and a transparent layer is provided as an outermost layer on each of the white or light-colored layers, with the layers being bonded to each other by thermal compression to form at least a five-layer structure.

16. The table game management system according to claim 15, wherein the transparent layer is embossed.

17. The table game management system according to claim 15,

wherein R chamfering is provided to an edge of the transparent layer.

18. An inspection apparatus for inspection of a game token of a plurality of game tokens, the inspection apparatus comprising:

a path including an inlet and an outlet through which a game token is allowed to pass;

at least one sensor; and

at least one processor, wherein the at least one processor is configured to:

based on output of the at least one sensor:

determine a color of a striped pattern on a side surface of the game token in an axial stacking direction of the game token as the game token moves along the path, where the game token has a multilayer structure in appearance, the multilayer structure including at least one white or light-colored layer and a colored layer that is darker than the at least one white or light-colored layer, thereby forming a striped pattern on a side surface of the game token in a stacking direction of the layers of the game token, wherein the color is of the colored layer, the color of the colored layer differing between different ones of the

plurality of game tokens; and

read a print on a surface of the game token sensed from a direction perpendicular to the path as the game token moves along the path;

identify a type of the game token based on the determined color, which distinguishes the type from types of other ones of the plurality of game tokens whose respective colors of their respective colored layers differ from the determined color;

identify the type of the game token based on the read print; and

determine whether the two identifications of the type of the game token match each other.

19. The inspection apparatus according to claim 18, wherein the path is inclined, and the at least one processor is further configured to inspect the print to ensure the print is proper.

20. The inspection apparatus according to claim 18, further comprising a mark reader that is configured to read a mark on the surface of the game token as the game token moves along the path to authenticate the game token, wherein the mark comprises an ultraviolet (UV) ink or carbon black ink.

21. A game token comprising a multilayer structure in

appearance having (a) a colored layer and (b) white or light-colored layers that are arranged alternately with the colored layer, thereby forming a striped pattern on a side surface of the game token in a stacking direction of the layers of the game token, wherein a type of the game token is identifiable based on a color of the colored layer.

22. The game token according to claim 21, further comprising a transparent outermost layer of the game token, wherein a print indicating the type of game token is provided on a surface of the white layer or light-colored layer.

23. The game token according to claim 21, wherein a surface of the white or light-colored layer includes a mark comprising an ultraviolet (UV) ink or carbon black ink.

24. The game token according to claim 21, further comprising an embossed transparent outermost layer of the game token.

25. The game token according to claim 21, further comprising an embossed transparent outermost layer of the game token, wherein an edge of the transparent layer is R chamfered.

26. The game token according to claim 21, wherein the colored layer comprises a plurality of layers.

27. The game token according to claim 21, further comprising a radio-frequency identification (RFID) device in the colored layer.

28. The game token according to claim 21, wherein the layers are layers.

29. The table game management system according to claim 1, wherein the measurement result obtained by the measurement device includes color information regarding (a) the colored layers, (b) the white or light-colored layers, or a combination thereof.

30. The table game management system according to claim 1, wherein the layers of the multilayer structure of the game tokens are layers.

31. The table game management system according to claim 2, further comprising a display, wherein the at least one processor is configured to display the respective win-loss result via the display.

32. The table game management system according to claim 31, wherein the display is integrated in a card distributor.

33. The table game management system according to claim 2, wherein the layers of the game tokens are layers.

34. The table game management system according to claim 2, wherein the multilayer structure is identical for a plurality of the game tokens except for the respective color of the colored layer, which differs between different ones of the game tokens that are of different types.

35. The table game management system according to claim 1, wherein the multilayer structure is identical for a plurality of the game tokens except for the respective color of the colored layer, which differs between different ones of the game tokens that are of different types.

36. The inspection apparatus of claim 18, wherein the multilayer structure is identical for a plurality of the game tokens except for the respective color of the colored layer, which differs between the different ones of the game tokens that are of the different types.