

Description

Title of Invention:

GAME SYSTEM, CARDS, CARD SHOE, AND CARD SHUFFLE APPARATUS

Technical Field

[0001]

The present invention relates to a game system with a function of detecting a fraud in a card game.

Background Art

[0002]

A system with a function of detecting a fraud in a card game is disclosed in, for example, International Publication No. WO02/064225A1. In the conventional system, a code indicating a group that cards belong to is set to the cards by printing or the like. A conventional inspection apparatus reads the code from each card of a used group. The inspection apparatus determines whether an abnormal card is mixed with the group based on the codes read from the cards.

[0003]

The conventional system contributes to prevention of a fraud by collecting the used cards and inspecting whether the cards belong to a predetermined group. However, the conventional system is not intended to

detect a fraudulent act on the spot when the fraudulent act is conducted.

[0004]

For example, cards are distributed to two players in baccarat. As is known, although baccarat is played by a player and a banker, the banker will also be called a "player" in the present application. In baccarat, a player flips a card by a method called "squeeze" during a game. A right to "squeeze" is usually granted to a player who has bet the highest amount. At the "squeeze", a fraud switches the cards using a technique like a magician. It is desirable to allow detection of such a fraudulent act on the spot.

[0005]

To prevent the fraudulent act, flip of the cards by the players can be prohibited. However, in baccarat, flip of the cards by the players is an important element of amusement in the game. Particularly, having a right to "squeeze" is a status in baccarat, and therefore, the "squeeze" is important for the amusement of the game.

[0006]

Although baccarat has been described in the example, the detection of a fraudulent act on the spot is similarly desired in other games, such as poker and blackjack.

[0007]

Other than the conventional inspection apparatus, various inspection apparatuses are proposed to detect a fraud. In a conventional apparatus, a code is used to print information on cards by UV-reactive ink. Various pieces of information are inspected by the code of the UV-reactive ink of the entering cards when the cards are delivered in the game table, and a mechanism for sequentially inspecting a large number of cards leaving from the game table is further provided. However, since the code is printed on the cards by the UV-reactive ink in the apparatus, a person who has acquired the cards by a fraudulent method can duplicate the cards, and a possibility remains that the person uses the cards for a fraudulent purpose.

[0008]

In recent years, instead of printing the information coded by the UV-reactive ink on the cards, there is a mechanism of incorporating IC chips, antennas, and the like into the cards and reading the information of the IC chips by a remote apparatus. However, in the remote reading of the information, the information may be stolen by an advanced hacking technique, and the reading cannot be used in a table game.

Citation List

Patent Literature

[0009]

Patent Literature 1: International Publication No.

WO02/064225A1

Summary of Invention

Technical Problem

[0010]

Embodiments of the present invention seek to provide a game system that can detect a fraudulent act of a card game on the spot and that can prevent duplication of cards by a person who has fraudulently acquired the cards.

Solution to Problem

[0010a]

According to an aspect of the present invention, there is provided a game system comprising: a card to which group information indicating a group of the card is attached as a sign code; card group information acquisition means for reading the sign code of the card that is to be placed on a game table to be used in each round of game, and acquiring the group information of the card; determination means for comparing the group information of the card read from the sign code with predetermined group information stored in advance, and determining whether the group information of the card matches the predetermined group information or not; and output means for outputting a determination result of the determination means, wherein the sign code is provided as chemical material and printed on the card, being mixed in paint or transparent liquid, and is configured to return, when irradiated with specific light, light in which specific wavelengths according to the sign code are combined, wherein the chemical material reflects combination of specific multi-wavelength light, which has a combination of specific

wavelengths, in response to specific light, and wherein the group information is determined by the combination of the specific multi-wavelength light detected by an optical sensor.
[0010b]

According to another aspect of the present invention, there is provided a card to which group information indicating a group of the card is attached as a sign code, wherein the sign code is provided as chemical material and printed on the card, being mixed in paint or transparent liquid, and is configured to return, when irradiated with specific light, light in which specific wavelengths according to the sign code are combined, wherein the chemical material reflects combination of specific multi-wavelength light, which has a combination of specific wavelengths, in response to specific light, and wherein the group information is determined by the combination of the specific multi-wavelength light detected by an optical sensor.

[0011]

There is also disclosed a game system including: cards with a molecular arrangement including coded group information indicating a group of the cards; group information acquisition means of entering cards that is installed on a game table and that is for reading the molecular arrangement of entering cards, which are cards that are delivered in each game, to acquire the group information of entering cards; determination means for comparing the group information of entering cards read from the molecular arrangement with predetermined group information to determine whether the group information of entering cards coincides with

the predetermined group information; and output means for outputting a determination result of the determination means.
[0012]

There is also disclosed a game system including: cards with a molecular arrangement including coded group information indicating a group of the cards; group information acquisition means of leaving cards that is installed on a game table and that is for reading the molecular arrangement of leaving cards, which are cards that leave from each game, to acquire the group information of leaving cards; determination means for comparing the group information of leaving cards read from the molecular arrangement with predetermined group information to determine whether the group information of leaving cards coincides with the predetermined group information; and output means for outputting a determination result of the determination means.

[0013]

There is also disclosed cards with a molecular arrangement including coded group information indicating a group of the cards.

[0014]

There is also disclosed a card shoe. The card shoe is installed on a game table and holds a plurality of cards, the card shoe allowing manual drawing of each card from an opening section, the

cards including a molecular arrangement including coded group information indicating a group of the cards, the card shoe including: group information acquisition means for reading the molecular arrangement of the cards to acquire the group information of the cards when the cards are fed; determination means for comparing the group information of the cards read from the molecular arrangement with predetermined group information to determine whether the group information of the cards coincides with the predetermined group information; and output means for outputting a determination result of the determination means.

[0015]

There is also disclosed a card shuffle apparatus. The card shuffle apparatus includes: a plurality of card stockers, each holding a plurality of cards; feeding rollers that feed each card from the plurality of card stockers, respectively; and a shuffled card stocker that is arranged at a position where the cards fed from the plurality of card stockers can be received and that holds the cards fed by the feeding rollers, the cards including a molecular arrangement including coded group information indicating a group of the cards, the card shuffle apparatus including: group information acquisition means for reading the molecular arrangement of the cards to acquire the group information of the cards when the feeding

rollers feed the cards; determination means for comparing the group information of the cards read from the molecular arrangement with predetermined group information to determine whether the group information of the cards coincides with the predetermined group information; and output means for outputting a determination result of the determination means.
[0016]

There is also disclosed a card shuffle apparatus including: a distribution card stocker that holds a plurality of cards; feeding rollers that feed each card from the distribution card stocker; a plurality of holding stockers that receive cards fed by the feeding rollers at different locations, respectively; and a shuffled card stocker that stacks and holds the cards of the plurality of holding stockers, the cards including a molecular arrangement including coded group information indicating a group of the cards, the card shuffle apparatus including: group information acquisition means for reading the molecular arrangement of the cards to acquire the group information of the cards when the feeding rollers feed the cards; determination means for comparing the group information of the cards read from the molecular arrangement with predetermined group information to determine whether the group information of the cards coincides with the predetermined group information; and output means for

outputting a determination result of the determination means.

[0017]

As described below, the present invention includes other aspects. Therefore, the disclosure of the invention intends to provide part of the aspects of the present invention and does not intend to limit the scope of the invention described and claimed herein.

Brief Description of Drawings

[0018]

[Figure 1] Figure 1 is an explanatory view showing a summary of a game system according to a first embodiment of the present invention.

[Figure 2] Figure 2 is a partial plan view of a card shoe including group information acquisition means according to the first embodiment of the present invention.

[Figure 3] Figure 3 is a partial side sectional view of the card shoe including the group information acquisition means according to the first embodiment of the present invention.

[Figure 4] Figure 4 is a plan view of a card printed with group information according to the first embodiment of the present invention.

[Figure 5] Figure 5 is a block diagram showing a summary of a DNA determination apparatus that determines group

information according to the first embodiment of the present information.

[Figure 6] Figure 6 is a configuration diagram of group information acquisition means of a game system according to a second embodiment of the present invention.

[Figure 7] Figure 7 is an explanatory view of a card shuffle apparatus according to an embodiment of the present invention.

[Figure 8] Figure 8 is an explanatory view of a modified example of the card shuffle apparatus according to an embodiment of the present invention.

Description of Embodiments

[0019]

Detailed description of the present invention will now be described. However, the following detailed description and the attached drawings do not limit the invention.

[0020]

The present invention provides a game system including: a card provided with DNA containing paint including group information indicating a group of cards; one or both of group information acquisition means of entering cards that is installed on a game table and that is for acquiring the group information of entering cards, which are cards that are delivered in each game, from the DNA containing paint of the entering cards and group

information acquisition means of leaving cards for acquiring the group information from leaving cards, which are cards that leave from the game; determination means for comparing the group information of entering cards obtained from the DNA containing paint or the group information of leaving cards with predetermined group information to determine whether the group information of entering cards or the group information of leaving cards coincides with the predetermined group information; and output means for outputting a determination result of the determination means.

[0021]

Furthermore, the present invention provides a game system including: cards provided with DNA containing paint including group information indicating a group of cards; group information acquisition means of entering cards for acquiring the group information of entering cards, which are cards that are delivered in a game, from the DNA containing paint of the entering cards; determination means for comparing the group information of entering cards obtained from the DNA containing paint with predetermined group information to determine whether the group information of entering cards coincides with the predetermined group information; and output means for outputting a determination result of the determination means.

[0022]

Furthermore, the group information acquisition means of entering cards in the game system may be group information acquisition means of entering cards for acquiring, sequentially or at once, the group information of entering cards from a plurality of cards used in a game, or the group information acquisition means of entering cards in the game system may be installed on a game table and arranged on a card shoe from which a dealer draws the cards used in the game.

[0023]

Furthermore, the present invention provides cards provided with DNA containing paint including group information indicating a group of the cards. Furthermore, in the cards of the present invention, the DNA containing paint is provided to the cards as anchor paint of the cards, the DNA containing painting is provided to the cards as coating painting of the cards, the DNA containing paint is provided to the cards as at least part of back design printing paint of the cards, ink printed on the cards indicating marks of numbers or suits of the cards contains the DNA containing paint, the DNA containing paint contains a plurality of types of DNA, and the group information includes at least one or a plurality of types of DNA.

[0024]

The DNA containing paint may be provided to the cards at a position other than the back design of the

cards or other than the marks indicating the numbers and the suits. The DNA containing paint may be ink for printing the back design of the cards or for printing the marks indicating the suits or the numbers, and the cards may contain different types of DNA for each color of the ink.

[0025]

According to the game system of the present invention, a fraudulent act in a card game can be detected on the spot, and furthermore, duplication of cards by a person who has fraudulently acquired the cards can be prevented.

[0026]

(First Embodiment)

A first embodiment of a game system of the present invention will now be described in detail. Figure 1 shows a table in which a game system of the present first embodiment is used. This table 1 is used in baccarat. However, it is obvious that the present invention can be applied to games other than baccarat.

[0027]

In Figure 1, the table 1 is depicted by a simplified drawing. In the implementation of the present invention, for example, a normal table of baccarat is used. As is known, baccarat is played by a player and a banker. However, both the player and the banker will be called "players" in the present invention. As shown in Figure 1,

a card shoe 3 and a collection port 5 are arranged on both sides of the table 1. The card shoe 3 is a providing source of cards, and the cards fed from the card shoe 3 are handed out to the players. After the end of the game, the cards are discharged from the collection port 5 and stored in a storage unit (not shown) of used cards.

[0028]

In the present embodiment, the cards that are delivered in each game will be called "entering cards", and the cards that leave from each game will be called "leaving cards". The entering cards are delivered in the table through the card shoe 3 in the game, and the leaving cards leave from the table through the collection port 5.

[0029]

(Acquisition of Group Information of Entering Cards)

Figure 2 is a partial plan view of the card shoe 3, and Figure 3 is a partial side sectional view of the card shoe 3. The card shoe 3 includes a group information acquisition unit 11 of entering cards (see Figure 1). Hereinafter, an example will be described, in which the group information acquisition unit 11 of entering cards includes a DNA sensor 13 and a card sensor 15.

[0030]

The card shoe 3 holds a plurality of cards 100. As shown in Figure 2 and Figure 3, the forefront card 100 is

slid over a slide surface 17 as shown by an arrow S and is fed on the table 1. Rails 19 for guiding the cards 100 are arranged on both sides of the slide surface 17 of the card shoe 3. As shown in Figure 2, the cards 100 are slid and fed while both sides of the cards 100 are in contact with the rails 19. In this way, the cards 100 are guided along the rails 19. The DNA sensor 13 is arranged on the slide surface 17. The DNA sensor includes a light source (not shown). Light from the light source is directed to DNA containing paint printed on the cards 100, and the DNA sensor 13 receives light at a predetermined frequency reflected from the DNA containing paint. As described later, the DNA sensor 13 can use a known technique described in, for example, Japanese Patent No. 3888807 to detect light emission from the DNA.

[0031]

Figure 4 shows the card 100 to be inspected. The group information is coded by DNA included in DNA ink (DNA containing paint) for printing marks 101 (suit and rank) of all cards including face cards (J, Q, and K). The DNA ink is ink blended with the DNA containing paint. The group information may also be printed by the DNA containing paint.

[0032]

Individual DNA included in the DNA containing paint cannot be determined by human vision under normal use

conditions. The DNA sensor 13 reads the group information provided to the cards when the cards 100 are guided and slid by the rails 19. The DNA sensor 13 is arranged at a position that allows reading the group information from the DNA containing paint included in the DNA ink for printing the marks 101 (suit and rank) of the cards 100 (see Figure 2 and Figure 3).

[0033]

The light source for reading the group information is integrated with the DNA sensor 13. In the present embodiment, the light source is, for example, LED that emits ultraviolet rays (UV LED). The use of the LED as a light source can downsize the DNA sensor 13. The card sensor 15 is arranged on the upstream (relative to a slide direction S of the cards) of the DNA sensor 13. When the card sensor 15 detects the cards 100, the card sensor 15 outputs, to the DNA sensor 13, a trigger signal for starting reading of the group information. The DNA sensor 13 that has received the trigger signal emits an ultraviolet ray from the light source. The DNA containing paint (the marks 101 in this case) printed on the cards 100 reflects light at a predetermined frequency when the ultraviolet ray is directed. The DNA sensor 13 receives the light at the predetermined frequency reflected from the DNA containing paint. The DNA sensor 13 and the card sensor 15 are connected to a DNA determination apparatus 21.

[0034]

(Acquisition of Group Information of Leaving Cards)

A group information acquisition unit 12 of leaving cards that acquires group information from leaving cards which are cards that leave from the game will be described. The group information acquisition unit 12 of leaving cards is arranged on the collection port 5 of the table 1 (see Figure 1). The group information acquisition unit 12 of leaving cards also includes the DNA sensor 13 and the card sensor 15 as in the group information acquisition unit 11 of entering cards and acquires the group information from the cards 100 that leave through the collection port 5 by similar operation as the group information acquisition unit 11 of entering cards. The group information acquisition unit 12 of leaving cards is also connected to the DNA determination apparatus 21.

[0035]

(Determination of DNA)

The DNA determination apparatus 21 includes electronic circuits including a microcomputer, a memory, and the like and has a configuration of a normal computer, such as a CPU, a ROM, and a RAM. The DNA determination apparatus 21 executes a program stored in the ROM to control the group information acquisition unit 11 of entering cards of the card shoe 3 and the group

information acquisition unit 12 of leaving cards to execute a process related to the group information.

[0036]

Figure 5 is a functional block diagram showing a configuration of the DNA determination apparatus 21. The DNA determination apparatus 21 has a function of receiving detection signals from the DNA sensor 13 and the card sensor 15 to read the group information of the cards 100.

[0037]

A reading instruction unit 23 instructs the start and the end of read operation by the DNA sensor 13. The reading instruction unit 23 causes the DNA sensor 13 to start reading when a detection signal indicating the existence of the cards 100 is received from the card sensor 15. In this way, the group information is read. An entering card information acquisition unit 25 acquires the group information of entering cards (entering card group information) from an output signal from the DNA sensor 13 (signal related to the group information obtained by the DNA sensor 13 from the entering cards). The entering card group information is group information for specifying the entering cards.

[0038]

The group information (preset correct group information) of the cards 100 used in the table 1 used for the game is stored in advance in a group information

storage unit 27 as group information of normal cards. In baccarat, the group information of normal cards is set in each casino in some cases, and the group information of cards handed out in each table used is registered in other cases.

[0039]

A leaving card information acquisition unit 29 acquires leaving card group information from an output signal from the DNA sensor (DNA sensor that acquires the group information from the leaving cards) of the group information acquisition unit 12 of leaving cards. The group information of leaving cards (leaving card group information) is group information for specifying the leaving cards.

[0040]

A determination unit 31 compares the entering card group information stored in the entering card information acquisition unit 25 as well as the leaving card group information acquired by the leaving card information acquisition unit 29 with the group information of normal cards stored in advance in the group information storage unit 27 of normal cards. The determination unit 31 compares the group information to determine whether the entering cards and the leaving cards coincide with the group information of normal cards.

[0041]

(Operation of Entire System)

As is known, baccarat is continuously played on the table 1. At the start of a game, when the dealer launches the game system, the DNA determination apparatus 21 is activated. The dealer takes out the cards one by one from the card shoe 3 and hands out the cards to the player. In this case, while handing out the cards 100 to the player, the dealer slides the cards 100 along the rails 19. When the cards are slid, the cards 100 move along a line L of Figure 4 over the DNA sensor 13, and the DNA sensor 13 receives the light at the predetermined frequency reflected from the DNA containing paint (the marks 101 in this case) printed on the cards 100.

[0042]

In the DNA determination apparatus 21, the entering card information acquisition unit 25 acquires the group information of entering cards (entering card group information) from an output signal (read signal) of the DNA sensor 13. The determination unit 31 compares the entering card group information acquired by the entering card information acquisition unit 25 with the group information of normal cards stored in advance in the group information storage unit 27 of normal cards. The determination unit 31 compares the group information to determine whether the group information of entering cards coincides with the group information of normal cards.

[0043]

In the present embodiment, light is directed to the DNA containing paint printed on the cards 100 when the forefront card 100 is fed on the table 1, and the DNA sensor 13 receives the light at the predetermined frequency reflected from the DNA containing paint. However, the present invention is not limited to this. For example, a change can be made so that the group information of entering cards is acquired from the card at the top of the card shoe 3, at a stage before the cards 100 are drawn out.

[0044]

In the DNA determination apparatus 21, the leaving card information acquisition unit 29 acquires the group information of leaving cards (leaving card group information) from an output signal (read signal) of the DNA sensor. The determination unit 31 compares the leaving card group information acquired by the leaving card information acquisition unit 29 with the group information of normal cards stored in advance in the group information storage unit 27 of normal cards. The determination unit 31 compares the group information to determine whether the group information of leaving cards coincides with the group information of normal cards. The DNA determination apparatus 21 is equivalent to determination means of the present invention.

[0045]

When the group information of entering cards or the group information of leaving cards coincides with the group information of normal cards stored in the group information storage unit 27 of normal cards, the determination unit 31 operates the output processing unit 33 to light up an LED element or the like of the result display unit 35 to output the fact that the cards are normal. On the other hand, when the group information of entering cards or the group information of leaving cards does not coincide with the group information of normal cards stored in the group information storage unit 27 of normal cards, the determination unit 31 operates the output processing unit 33 to light up a warning (such as a buzzer) or a lamp (not shown) indicating the entering or the leaving of abnormal cards. The LED element or the like of the result display unit 35, the warning, and the lamp are equivalent to output means of the present invention.

[0046]

In the present embodiment, the DNA containing paint and the DNA sensor that detects the DNA containing paint are used. The group information of the DNA containing paint cannot be read by human vision and is an example of group information that can be read under a predetermined condition. For example, natural DNA and artificial DNA can be used as the DNA for coding the group information. A molecular arrangement with a periodical arrangement,

such as a base arrangement of DNA, can be used to code the group information. For example, an amino acid arrangement of protein may be used to code the group information.

[0047]

(Second Embodiment)

A second embodiment of the game system of the present invention will now be described. Figure 6 is a configuration diagram of a group information acquisition unit of the game system according to the second embodiment of the present invention. The same configuration as in the first embodiment will not be described.

[0048]

(Card Shoe)

In the present second embodiment, a group information acquisition unit 41 of entering cards is arranged on a card shoe 43 from which the dealer draws the cards 100 used in the game, and the group information acquisition unit 41 acquires, sequentially or at once, the group information of the cards 100 from the plurality of cards 100 used in the game. As shown in Figure 6, the group information acquisition unit 41 of entering cards includes a plurality of light sources and a plurality of DNA sensors. The plurality of light sources and the plurality of DNA sensors are arranged below the card holding unit 45 that holds the plurality of cards 100.

In the case of the group information acquisition unit 41 of entering cards, the group information can be sequentially or collectively acquired from the cards 100 before the cards 100 are distributed on the table, even if the card holding unit 45 holds a large number of cards 100. Therefore, whether the read cards are the same group of cards can be efficiently determined in advance. When the cards that are not normal (fraudulent cards) are mixed, the acquired group information of entering cards and the group information of normal cards stored in the group information storage unit 27 of normal cards are compared and determined, and if the information does not coincide, a warning (such as a buzzer) is issued. In this way, the existence of abnormal cards (fraudulent cards) can be efficiently detected in advance. The determination result may be output by a warning sound, or a sound other than the warning sound, such as a voice message and a melody, may be output.

[0049]

(Card Shuffle Apparatus)

The present invention can also be applied to a card shuffle apparatus. Figure 7 is an explanatory view of a card shuffle apparatus 51 according to an embodiment of the present invention. As shown in Figure 7, the card shuffle apparatus 51 includes: two card stockers 53, each holding a plurality of cards (for example, a deck of cards); two feeding rollers 55 that feed each card from

the two card stockers 53; and a shuffled card stocker 57 that holds cards alternately fed by the two feeding rollers 55.

[0050]

In this case, the two feeding rollers 55 can vertically move (swing) to rotate around a fulcrum 0 to alternately feed the cards one by one from the two card stockers 53. Although Figure 7 illustrates a case in which the number of the card stockers 53 and the feeding rollers 55 is two, the number of the card stockers 53 and the feeding rollers 55 is not limited to this. For example, the number of the card stockers 53 and the feeding rollers 55 may be three or more.

[0051]

The shuffled card stocker 57 is arranged at a position where the cards fed from the two card stockers 53 can be received, and in the example of Figure 7, the shuffled card stocker 57 is arranged midway between the two card stockers 53. The shuffled card stocker 57 holds cards (for example, two decks of cards) shuffled by alternate drawing. As described, the DNA containing paint including coded group information indicating a group of cards is provided to the cards.

[0052]

As shown in Figure 7, the card shuffle apparatus 51 includes the group information acquisition unit 11 (the DNA sensor 13 and the card sensor 15) that reads the DNA

arrangement included in the DNA containing paint to acquire the group information of the cards when the feeding rollers 55 feed the cards. Although not illustrated here, the group information acquisition unit 11 is connected to the DNA determination apparatus 21 that compares the group information of the cards read from the DNA arrangement with the predetermined group information to determine whether the group information of the cards coincides with the predetermined group information. Similarly, although not illustrated here, the card shuffle apparatus 51 includes an LED element, a warning, a lamp, or the like, and the determination result can be output. The card shuffle apparatus 51 also includes a camera 59 that takes images of the cards fed by the feeding rollers 55. The camera 59 is connected to an image analysis apparatus (not shown) for inspecting whether the back design on the back side of the cards 100 or the suit (type) and the rank (number) on the front are correctly printed, or inspecting a print state of the cards, such as presence of a scratch, or the other quality defect, such as a scratch and a stain, to inspect the cards. The group information acquisition unit 11 or the camera 59 is further connected to a card counter (not shown) that counts the number of the cards 100 fed by the feeding rollers 55, and the number of the fed cards 100 is recorded.

[0053]

Figure 8 is an explanatory view of another example (modified example) of the card shuffle apparatus 51. As shown in Figure 8, the card shuffle apparatus 51 includes: a distribution card stocker 61 that holds a plurality of cards (for example, two decks of cards); the two feeding rollers 55 that feed each card from the distribution card stocker 61; two holding stockers 63 that receive the cards (for example, one deck of cards) fed by the feeding rollers 55 at different locations; and the shuffled card stocker 57 that stacks and holds the cards of the two holding stockers 63.

[0054]

In this case too, the two feeding rollers 55 can vertically move (swing) to rotate around the fulcrum O to alternately feed the cards one by one to the two holding stockers 63. Although Figure 8 illustrates a case in which the number of the holding stockers 63 and the feeding rollers 55 is two, the number of the holding stockers 63 and the feeding rollers 55 is not limited to this. For example, the number of the holding stockers 63 and the feeding rollers 55 may be three or more.

[0055]

The shuffled card stocker 57 is arranged at a position where the cards fed from the two holding stockers 63 can be received, and in the example of Figure 8, the shuffled card stocker 57 is arranged midway between the two holding stockers 63. The shuffled card

stocker 57 holds the cards (for example, two decks of cards) shuffled by being stacked after alternate drawing. The DNA containing paint including the coded group information indicating a group of cards is also provided to the cards.

[0056]

As shown in Figure 8, the card shuffle apparatus 51 includes the two group information acquisition units 11 (the DNA sensors 13 and the card sensors 15) that reads the DNA arrangement included in the DNA containing paint to acquire the group information of cards when the cards are fed by the feeding rollers 55. Although not illustrated here, the group information acquisition units 11 are connected to the DNA determination apparatus 21 that compares the group information of the cards read from the DNA arrangement with the predetermined group information to determine whether the group information of the cards coincides with the predetermined group information. Similarly, although not illustrated here, the card shuffle apparatus 51 includes an LED element, a warning, a lamp, or the like, and the determination result can be output. The card shuffle apparatus 51 also includes cameras 59 that take images of the cards fed by the feeding roller 55. The cameras 59 are also connected to the image analysis apparatus (not shown) for inspecting whether the back design on the back side of the cards 100 or the suit (type) and the rank (number) on

the front are correctly printed, or inspecting the print state of the cards, such as presence of a scratch, or the other quality defect, such as a scratch and a stain, to inspect the cards. The group information acquisition units 11 or the cameras 59 are further connected to the card counter (not shown) that counts the number of the cards 100 fed by the feeding rollers 55, and the number of the fed cards 100 is recorded.

[0057]

For example, the cards of the present invention can be applied not only to playing cards used in casinos and the like, but also to so-called gaming cards (trading cards). A set of a predetermined number of various cards is sold in the trading cards. More specifically, a set of randomly combined different cards is sold. The shuffle apparatus 51 of the present invention can be used for the random combination.

[0058]

Since the individual trading cards (particularly rare cards) are converted into cash or exchanged, the determination of the authenticity of the cards is an important factor. In the present invention, information, such as manufacturer of cards, serial number, production date, and production lot, can be coded along with the group information (or coded as the deck information), and the reliability of the determination of the authenticity can be improved.

[0059]

(Cards)

In the cards of the present invention, the group information is read by the DNA containing paint included in the ink for printing the marks 101 (suit and rank). In the cards of the present invention, the DNA containing paint may be included in the paper of the cards. For example, the DNA containing paint may be provided to the cards as anchor paint for adjusting the groundwork of the paper of the cards. In such cards, the group information can be similarly read from the DNA containing paint included in the anchor paint. The DNA containing paint may also be provided to the cards as coating paint outside of the cards. The DNA containing paint may also be provided to the cards as at least part of the back design printing paint of the cards. The DNA containing paint may include a plurality of types of DNA, and the group information may be coded by at least one or a plurality of types of DNA. In this way, deciphering by a fraud can be more difficult.

[0060]

The set of the entering card group information and the leaving card group information may be for one deck or for a plurality of decks. For the group information with similar results, it is obvious that the group information other than the group information of each casino or each table can be used. Although the DNA determination

apparatus 21 stores the group information in advance, the type of the group information may be different for each card providing source (such as a card shoe), or different group codes may be set for each production lot or each casino used.

[0061]

The DNA containing paint may be separately provided to the cards at a position other than the back design of the cards or at a position other than the marks indicating the rank or the suit of the cards. Alternatively, the DNA containing paint may include different types of DNA for each color of the ink.

[0062]

(DNA ink)

The DNA ink used in the present invention will be described. The DNA ink is developed by nanotechnology and molecular science. DNA is combined to form a sign code or a decryption code, and the DNA ink has a security function based on invisible DNA. The sign code or the decryption code based on DNA has a size from individual atoms to a polymer and is a complex of chemical substances of about 0.5 to 5 microns. There are infinite types (about 30 trillion or more), and the sign code and the decryption code can be easily produced or reproduced. To prevent counterfeiting or reading, a true sign code can be slipped into a large number of false codes. It is almost impossible for the counterfeiter to duplicate the

same codes in the first place, and in addition, the counterfeiter cannot recognize which one is the true sign code. Therefore, the security is high. The sign code or the decryption code based on DNA is transparent and invisible. Therefore, if the sign code or the decryption code is mixed with a transparent liquid or ink, the mixing of DNA cannot be usually recognized. It is significantly difficult to remove or inactivate only the mixed or added sign code or the like based on DNA ink or to deprive the function.

[0063]

When specific light, such as UV with a narrow band, is applied to the sign code based on DNA, complicated light with a combination of specific wavelengths according to the sign code is returned. Optical sensor (opto-electronics sensor) can convert the returned light to an electrical signal, and the signal can be deciphered to determine the presence of an intended sign code. A small amount of the DNA forming the sign code or the decryption code can be just mixed with another target material, such as pulp, ink, and varnish, to use the DNA. The material is stable, and the target material of mixing is not affected. Therefore, the use of the DNA ink or the like does not affect the normal production process and production speed.

[0064]

The DNA can be determined almost in real time (in reality, 0.01 second or less) using a device that deciphers an opto-electronics signal that is returned when specific light is applied to the object. A commonly used hologram or the like is visible, and for example, as for a method of using specific metal particles as the group information, even an invisible type can be duplicated. In this regard, the conventional method has a weakness compared to when DNA is used.

[0065]

Although various embodiments of the present invention have been described, it is obvious that those skilled in the art can modify the embodiments within the scope of the present invention. For example, the present invention can be used in a game other than baccarat, such as blackjack, and the apparatuses of the present embodiments can be appropriately modified according to the needs in an applied game.

[0066]

Although the preferred embodiments of the present invention that can be considered at the moment have been described, it will be understood that various modifications are possible for the present embodiments, and it is intended that the appended claims include all modifications within the true spirit and scope of the present invention.

Industrial Applicability

[0067]

As described, the game system according to the present invention has advantageous effects that a fraudulent act in a card game can be detected on the spot and that duplication of cards by a person who has fraudulently acquired the cards can be further prevented. The game system can be applied to various card games and are useful.

Reference Signs List

[0068]

- 1 table
- 3 card shoe
- 5 collection port
- 11 group information acquisition unit of entering cards
- 12 group information acquisition unit of leaving cards
- 13 DNA sensor
- 15 card sensor
- 17 slide surface
- 19 rail
- 21 DNA determination apparatus
- 23 reading instruction unit
- 25 entering card information acquisition unit
- 27 group information storage unit
- 29 leaving card information acquisition unit
- 31 determination unit

33 output processing unit
35 result display unit
41 group information acquisition unit of entering cards
43 card shoe
45 card holding unit
51 card shuffle apparatus
53 card stocker
55 feeding roller
57 shuffled card stocker
61 distribution card stocker
63 holding stocker
100 card
101 mark

CLAIMS

[Claim 1]

A game system comprising:

a card to which group information indicating a group of the card is attached as a sign code;

card group information acquisition means for reading the sign code of the card that is to be placed on a game table to be used in each round of game, and acquiring the group information of the card;

determination means for comparing the group information of the card read from the sign code with predetermined group information stored in advance, and determining whether the group information of the card matches the predetermined group information or not; and

output means for outputting a determination result of the determination means,

wherein the sign code is provided as chemical material and printed on the card, being mixed in paint or transparent liquid, and is configured to return, when irradiated with specific light, light in which specific wavelengths according to the sign code are combined,

wherein the chemical material reflects combination of specific multi-wavelength light, which has a combination of specific wavelengths, in response to specific light, and

wherein the group information is determined by the combination of the specific multi-wavelength light detected by an optical sensor.

[Claim 2]

The game system according to claim 1, comprising:
card group information acquisition means for reading the sign code of a card that is placed on the game table and that exits after being used in each round of game, and acquiring the group information of the card,

wherein the determination means compares the group information of the card read from the sign code with predetermined group information, and determines whether the group information of the card matches the predetermined group information or not.

[Claim 3]

The game system according to claim 1 or 2, wherein a back design of the card or a mark showing a rank or a suit of the card is printed on the card using the paint or the transparent liquid.

[Claim 4]

The game system according to claim 1 or 2, wherein the sign code is attached to the card at a position not overlapping a mark showing a rank or a suit of the card.

[Claim 5]

The game system according to any of claims 1 to 4, wherein the group information is coded by at least one or a plurality of sign codes among a plurality of types of sign codes.

[Claim 6]

The game system according to any of claims 1 to 5, wherein the card group information acquisition means is provided to a card shoe that is used when a dealer delivers a card that is to be placed on the game table to be used in each game.

[Claim 7]

The game system according to any of claims 1 to 6, wherein the group information indicating the group of the card includes at least one of a manufacturer, a manufacturing date, a manufacturing lot and a manufacturing number.

[Claim 8]

The game system according to any of claims 1 to 7, wherein the group information indicating the group of the card is set to a plurality of decks.

[Claim 9]

A card to which group information indicating a group of the card is attached as a sign code, wherein the sign code is provided as chemical material and printed on the card, being mixed in paint or transparent liquid, and is

configured to return, when irradiated with specific light, light in which specific wavelengths according to the sign code are combined,

wherein the chemical material reflects combination of specific multi-wavelength light, which has a combination of specific wavelengths, in response to specific light, and

wherein the group information is determined by the combination of the specific multi-wavelength light detected by an optical sensor.

[Claim 10]

The card according to claim 9, wherein a back design of the card or a mark showing a rank or a suit of the card is printed on the card using the paint or the transparent liquid.

[Claim 11]

The card according to claim 9, wherein the sign code is attached to the card at a position not overlapping a mark showing a rank or a suit of the card.

[Claim 12]

The card according to any of claims 9 to 11, wherein the group information is coded by at least one or a plurality of sign codes among a plurality of types of sign codes.

[Claim 13]

The card according to any of claims 9 to 12, wherein the group information indicating the group of the card includes at least one of a manufacturer, a manufacturing date, a manufacturing lot and a manufacturing number.

[Claim 14]

The card according to any of claims 9 to 13, wherein the group information indicating the group of the card is set to a plurality of decks