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TABLE GAME MANAGEMENT SYSTEM AND GAME TOKEN

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ABSTRACT

A system comprising: a camera; and a control device; wherein: the camera is configured to generate an image of an area in which one or more chips are located; and the control device is configured to, for each of the one or more chips: identify in the image a respective color pattern formed by a respective set of colors on a respective circumferentially extending side face of the respective chip; and based on the identified color pattern, determine a respective type or value of the respective chip; and generate an output based on the respective determined types or values of the chips.

DESCRIPTION

TABLE GAME MANAGEMENT SYSTEM AND GAME TOKEN

Technical Field

[0001]

The present invention relates to a table game management system in a game hall.

Background Art

[0002]

In game halls such as casinos, various attempts have been made to prevent dealers from mishandling game tokens (chips). Game halls are equipped with surveillance cameras for monitoring the mishandling of chips by dealers to, for example, determine mishandling and fraud in collecting game tokens and distributing game tokens as a reward contradicting win-loss results on the basis of images obtained from the surveillance cameras, thereby preventing mishandling and fraud.

[0003]

On the other hand, there has been proposed a technique of grasping the number and total amount of bet game tokens by attaching an IC tag to each game token to grasp the amount of the game token.

[0004]

The card game monitoring system disclosed in Patent

Literature 1 is designed to determine whether the game tokens placed on a game table have been collected or distributed as a reward according to win-loss results, by image analysis of the movements of the game tokens, thereby monitoring the mishandling of chips by the dealer.

Citation List

Patent Literature

[0005]

Patent Literature 1: WO 2015/107902

Summary of Invention

Technical Problem

[0006]

In a game hall such as a casino, game tokens are stacked so high on a game table that the IC tag reader provided below the game table cannot correctly read the total amount of the tokens. Increasing the sensitivity of the reader will add together the amounts of game tokens placed at different positions (a win or loss depends on each position), thus leading to a failure to grasp the total amount of game tokens at each position. In addition, conventionally, as illustrated in Fig. 2, a game token (chip) T has a complex design. Stacking a large number of such chips makes it impossible to correctly grasp the

number of stacked chips with a camera.

[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

[0009]

In order to solve the various problems described above, a table game management system according to the present invention 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 placed on the game table, and a management control device that identifies and stores positions, types, and number of game tokens placed on the game table by a game participant by using a measurement result obtained by the measurement device in each game, wherein the game token has a multi-layer structure 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 intermediate colored layer, so as to be configured 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, and the management control device has a calculation function of determining participants in each game as a winner and a loser by using a win-loss result obtained from the card distributor and a measurement result on the positions, types, and number of game tokens placed by the game participants, and performing casino-side balance calculation on the game table for each game.

[0010]

In addition, in the management system, the management control device is configured to have a function of

determining the number of game tokens by measuring the number of colored layers, white layers, or light-colored layers of game tokens placed by each game participant.

[0011]

In order to solve the various problems described above, a game token according to the present invention 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]

In order to solve the various problems described above, an inspection apparatus that inspects a game token according to the present invention 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.

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Advantageous Effects of Invention

[0015]

A system according to 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

[0016]

Fig. 1 is a plan view illustrating an outline of an overall table game management system in a game hall according to an embodiment of the present invention.

Fig. 2 is a perspective view of conventional game tokens.

Fig. 3 is a front sectional view of a game token according to the embodiment of the present invention.

Fig. 4 is a perspective view illustrating a stacked state of game tokens which is grasped according to the embodiment of the present invention.

Fig. 5A is a front view of a game token according to the embodiment of the present invention.

Fig. 5B is a plan view of a game token according to the embodiment of the present invention.

Fig. 6 is a side sectional view of an inspection apparatus for game tokens according to the embodiment of the present invention.

Fig. 7 is a perspective photographic view for explaining a stacked state of different types of game tokens according to the embodiment of the present invention.

Description of Embodiments

[0017]

A table game management system in a game hall having game tables according to an embodiment of the present invention will be described below. Fig. 1 illustrates an overall outline of the system. The table game management system in a game hall having a plurality of game tables 1 includes a measurement device 6 including an image analysis device 5 that records the progress state of a game played on the game table 1, including game participants 2 and a dealer 3, as a video, via a plurality of cameras 4, and also performs image analysis on the recorded video of the progress state of the game, and a card distributor 7 that determines and displays win-loss results on each game on the game table 1. The card distributor 7 has been used and known by a person skilled in the art. The card distributor is a so-called electronic shoe, in which game rules are

programmed in advance to determine a win or loss on the game by reading the information (rank and suite) of a distributed card C. In playing the Baccarat game, a banker's win, player's win, and tie (draw) are basically determined on the basis of the ranks of two or three cards, and a display lamp 8 displays the determination results (win-loss results).

[0018]

A management control device 9 reads the information (rank and suite) of the card C obtained from the card distributor 7 and determines a win-loss result on each game. The management control device 9 also determines winners 2W and a loser 2L of the participants 2 in each game by using measurement results on the positions, types, and number of game tokens 100 (chips T) placed by the game participants 2. The management control device 9 also has a calculation function of calculating, for each game, a casino-side balance on the game table 1 (the amount obtained by subtracting the total amount of the game tokens 100 (chips T) distributed as a reward to the winners 2W of the participants 2 from the total amount of the game tokens 100 (chips T) bet by the loser 2L).

[0019]

The image analysis device 5, the measurement device 6, and the management control device 9 in this detection

system each have a composite structure including a computer, program, and memory in an integrated or discrete form.

[0020]

A game token (chip) used in this detection system will be described in detail next. Fig. 3 is a front sectional view of the game token (chip T) 100 used in the detection system. This game token has a multi-layer structure having a plurality of plastic layers with a plurality of different colors stacked on each other. This multi-layer structure includes a colored layer 101 provided at least intermediately, with white layers 102 or light-colored layers (although not illustrated, any layers lighter in color than the colored layer 101) being stacked on the two sides of the colored layer 101. As described above, the game token includes the colored layer 101 and has the white layers 102 or light-colored layers (although not illustrated, any layers lighter in color than the colored layer 101) stacked on the two sides of the colored layer 101, thus forming a multi-layer structure. As illustrated in Fig. 5A, this forms a striped pattern on a side surface in the stacking direction. Changing the color of the colored layer 101 (to red, green, yellow, blue, or the like) makes it possible to identify the type of game token 100 (for example, 10 points, 20 points, 100 points,

and 1000 points).

[0021]

In addition, as illustrated in Fig. 5B, prints 103 (indicating 100 points or the like) indicating the type of game token 100 are formed on the surfaces (upper and lower surfaces) of the white layer 102 of the game token 100, and transparent layers 104 are provided on the outermost layers. The respective layers are bonded to each other by thermal compression to form at least a five-layer structure. Each game token 100 is formed by bonding the respective layers (the colored layer 101, the white layers 102, and the transparent layers 104), each formed from an elongated plastic material, by thermal compression into a tightly bonded structure (for example, a five-layer structure) and then punching it into, for example, a circular or rectangular shape using a press or like. When this structure is punched by a press, the dimensions of the die and punch used for punching are designed to provide R chamfering (round edges) to the edges of the transparent layers 104 on the outermost layers.

[0022]

In addition, the surfaces of the white layer 102 of the game token 100 are provided with marks M printed by UV ink or carbon black ink. The marks M authenticate the game token 100. The marks M are visible when irradiated with

ultraviolet light (or infrared light). A combination of the shape and number of such marks implements authentication. The transparent layers 104 are formed on the outermost layers by thermal compression bonding or a coating process (application) so as to cover the prints 103 and the marks M. The transparent layers 104 are embossed to prevent the game tokens 100 from clinging to each other.

[0023]

The edges of the transparent layers 104 on the outermost layers, which are provided with the prints 103 (indicating 100 points or the like), are R-chamfered (R) to prevent the surfaces of the white layers 102 from being deformed and exposed from the side surface in a punching process for the game token 100. This also prevents the game token 100 from damaging the hands and other chips T with sharp edges that are left unchamfered.

[0024]

As illustrated in Fig. 3, the colored layer 101 may be formed from a plurality of colored layers (three layers in Fig. 3). Because the plurality of colored layers (three layers in Fig. 3) are bonded to each other by thermal compression, the three-layer structure cannot be visually recognized unlike in Fig. 3. That is, Fig. 3 illustrates the three layers for the sake of descriptive convenience. In addition, a hollow portion B is provided in part of the

intermediate layer of the three layers of the colored layer 101, and an RFID is embedded in the hollow portion.

[0025]

The management control device 9 captures images of the game tokens 100 placed by the participants 2 in a game on the game table 1 by using the camera 4, and performs measurement for each area 24, on which the game tokens are placed, (to detect whether the participant has bet on the banker, player, pair ("PAIR"), or tie ("TIE")) by using the measurement device 6 including the image analysis device 5. In addition, the management control device 9 determines the types and number of game tokens 100 (chips T) stacked on each area by causing the measurement device 6 (using the information obtained by the image analysis device 5) to analytically measure the number and colors of the colored layers 101 (or light-colored layers) or the white layers 102 of the game tokens 100.

[0026]

The management control device 9 may be a control device using artificial intelligence or having a deep learning structure. The management control device 9 can grasp, via the camera 4 and the image analysis device 5, the positions 24 (each position indicating whether the corresponding participant has bet on the player, banker, or pair), types (different amounts are assigned to the game

tokens 100 for the respective colors), and numbers of game tokens T bet by the respective participants 2. A computer or control system using artificial intelligence and a deep learning (structure) technique can grasp the positions 24 (each position indicating whether the corresponding participant has bet on the player, banker, or pair), types (different amounts are assigned to the game tokens for the respective colors), and numbers of the game tokens T by using a self-learning function or the like. This allows the management control device 9 to determine, on the basis of analysis on each video indicating the progress state of each game via the image analysis device 5, whether the game token 100 bet by the participant 2L who has lost the game has been properly collected (indicated by an arrow L) and the game tokens 100 have been properly distributed as a reward to the participants 2W who have won the game in accordance with the win-loss results on the game determined by the card distributor 7.

[0027]

In such a case, as illustrated in Fig. 4, each chip has a multilayer structure having stacked layers (as compared with the conventional chip illustrated in Fig. 2), with a stripe pattern being sharply formed on the side surface in the stacking direction, and hence the measurement device 6 including the image analysis device 5

can easily and correctly measure the types and number of chips. In addition, using a computer or control system using artificial intelligence or a deep learning (structure) technique makes it possible to implement more correct image analysis and determination. Because the computer or control system using artificial intelligence and the deep learning (structure) technique have already been known by a person skilled in the art, and are available, a detailed description of them will omitted.

[0028]

The management control device 9 can analytically grasp the total amount of the game tokens T in a game token tray 10 of the game table 1 which belongs to the dealer 3 by using the image analysis device 5. After balance settlement at the end of a given game, the management control device 9 can comparatively calculate, on the basis of win-loss results on the game, whether the total amount of the game tokens T in the game token tray 10 has increased or decreased, in accordance with the collection of the game tokens T bet by each participant 2 who has lost the game and a redemption amount TW of the game tokens bet by the game participants 2W who have won the game. Although the total amount of the game tokens T in the game token tray 10 is always grasped by means such as RFIDs, the management control device 9 determines whether an increase

or decrease in the total amount is correct, by analyzing a video representing the progress state of a game via the image analysis device 5. These operations may also be performed by using an artificial intelligence structure or deep learning structure.

[0029]

The management control device 9 may have an artificial intelligence structure or deep learning structure that can grasp the position of a game token bet at each play position 22 on the game table 1 (each position indicating whether the corresponding participant has bet on the player, banker, or pair) and an amount (the types and number of game tokens), and can extract a peculiar situation (set by the casino) by comparing the win-loss history of each game participant 2 and the obtained amount of game tokens (winning amount) obtained from a win-loss result on each game with the statistical data of many past games (big data). Typically, the management control device 9 having such an artificial intelligence structure or deep learning structure can extract, as peculiar situations, a situation in which a winning amount has exceeded a certain amount (million dollars) and a situation in which the amounts of game tokens lost are small and the amounts of game tokens won are large at a given one of the positions 22 on the game table 1 over several consecutive games as

compared with the statistical data (big data or the like) of past games.

[0030]

The management control device 9 has a structure capable of comparatively calculating the total amount of the game tokens 100 in the game token tray 10 of the game table 1 which belongs to the dealer 3 so as to indicate, after balance settlement of the game tokens 100 bet by the respective participants 2 in each game, whether the calculated increase or decrease in the amount of game tokens corresponds to the balance settlement is correct. In the chip tray 10 for holding the game tokens 100 of the dealer 3 illustrated in Fig. 1, the types and number of game tokens 100 can be determined by causing the measurement device 6 (using the information obtained by the image analysis device 5) to analytically measure the number and colors of the colored layers 101 or white layers 102 of the game tokens 100 (chips T) stacked in the lateral direction. The total amount of the game tokens 100 in the chip tray 10 for holding chips is always (or at predetermined time intervals) grasped in this manner. The management control device 9 has a calculation function of performing, for each game, calculation of the settled amount of each game (casino-side balance calculation on the game table 1 (the amount obtained by subtracting the total

amount of game tokens 100 (chips T) distributed as a reward to the winners 2W of the participants 2 from the total amount of game tokens 100 (chips T) bet by the loser 2L)) (see paragraph 0018). This makes it possible to always (or at predetermined time intervals) verify the total amount of the game tokens 100 in the game token tray 10. That is, it is verified whether an increase or decrease in the amount of game tokens matches the settled amount of each game on the basis of the image analysis result dealer 3 obtained by the image analysis device 5.

[0031]

An inspection apparatus 200 that inspects the game token 100 according to the embodiment of the present invention will be described next. The inspection apparatus 200 includes a path 203 having an inlet 201 and an outlet 202 through which the game token 100 can pass in the radial direction (the arrow Y direction). The path 203 is inclined, and the game token 100 passes through the path 203 in the arrow Y direction. The path 203 includes a chip type determination device 204 that determines the color of the striped pattern on the side surface of the game token 100 in the stacking direction by shooting the side surface, a mark reader 205 that reads the marks M printed by UV ink or carbon black ink and provided on the surface of the passing game token 100, a print inspection apparatus 206

that reads the print 103 provided on the surface of the game token from a direction perpendicular to the path 203, and a control device 207 for the overall apparatus. The control device 207 is configured to inspect whether the chip type determined by the chip type determination device 204 matches the information of the print representing a type, which is obtained from the print inspection apparatus 206.

[0032]

The inspection apparatus 200 can inspect whether each print 103 on the manufactured game token 100 has been properly printed so as to match the chip type represented by the color of the striped pattern on the game token 100.

Reference Signs List

[0033]

1 game table

2 player

3 dealer

4 camera

5 image analysis device

6 measurement device

7 card distributor that determines and displays win-loss results on games

9 management control device

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10 game token tray

100(T) game token

200 inspection apparatus

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CLAIMS

1. A system comprising:

a camera; and

a control device;

wherein:

the camera is configured to generate an image of an area in which one or more chips are located; and

the control device is configured to, for each of the one or more chips:

identify in the image a respective color pattern formed by a respective set of colors on a respective circumferentially extending side face of the respective chip; and

based on the identified color pattern, determine a respective type or value of the respective chip; and

generate an output based on the respective determined types or values of the chips.

2. The system of claim 1, wherein the camera is configured to generate an image of plurality of chips placed on plurality of betting areas, and the control device is configured to identify types or values of chips placed on plurality of betting areas using an artificial intelligence or machine learning technology.

3. The system of claim 2, wherein the chips are placed at different distances from the camera.

4. The system of claim 3, wherein the control device is further configured to identify the position of chips placed on plurality of betting areas.

5. The system of claim 1, wherein, for each of the chips, the respective determination of the respective type or value

of the respective chip is based on a respective combination of two or more colors of the pattern on the side face of the respective chip.

6. The system of claim 1, wherein each of at least one of the set of colors of the respective color pattern extends at least partially in a circumferential direction to a greater degree than an extent to which the respective color extends perpendicularly to the circumferential direction.

7. The system of claim 1, wherein the control device is configured to identify an error state based on the determined types or values of the one or more chips, and the output is the error identification.

8. The system of claim 1, wherein the control device is configured to:

obtain a game result of a game played using the chips; and

for each of one or more players of the game and/or for a casino, determine a respective balance amount, a respective collection amount for the game, and/or a respective payment amount for the game based on (a) the obtained game result, (b) the identified types or values of the chips.

9. The system of claim 1, wherein the control device is configured to determine the respective balance amount, collection amount, and/or payment amount further based on one or more numbers of the chips identified in the image and one or positions of a game table at which the control device identifies the chips to be located in the image.

10. The system of claim 1, wherein the control device is configured to identify an error state based on the determined balance amount, collection amount, and/or payment amount, and the output is the error identification.

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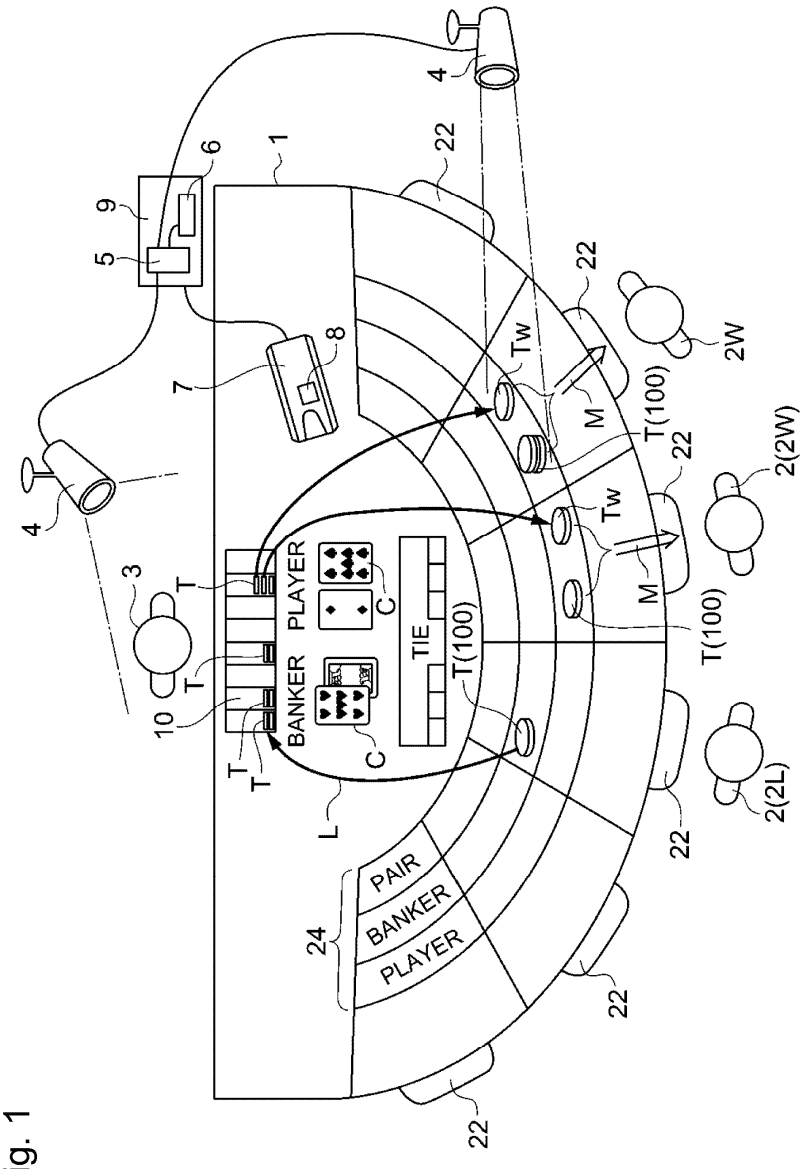

Fig. 1

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Fig. 2

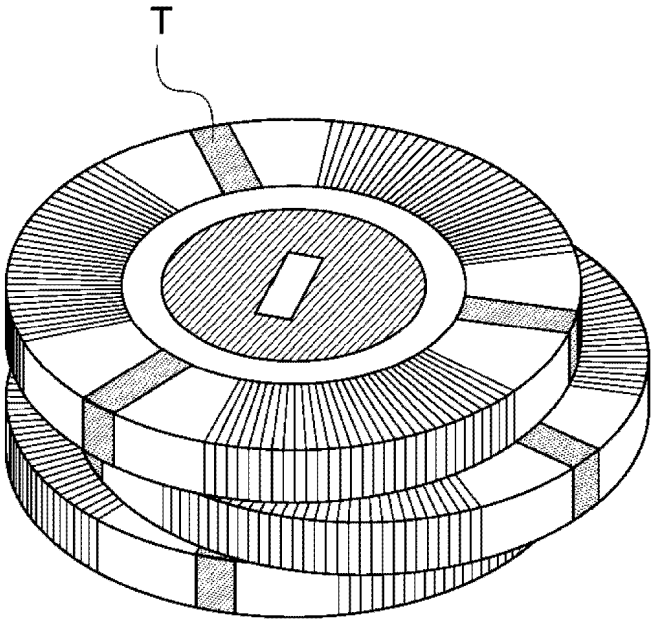

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Fig. 3

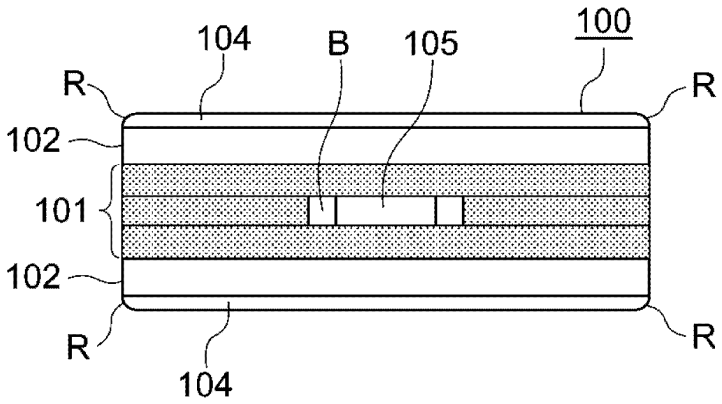

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Fig. 4

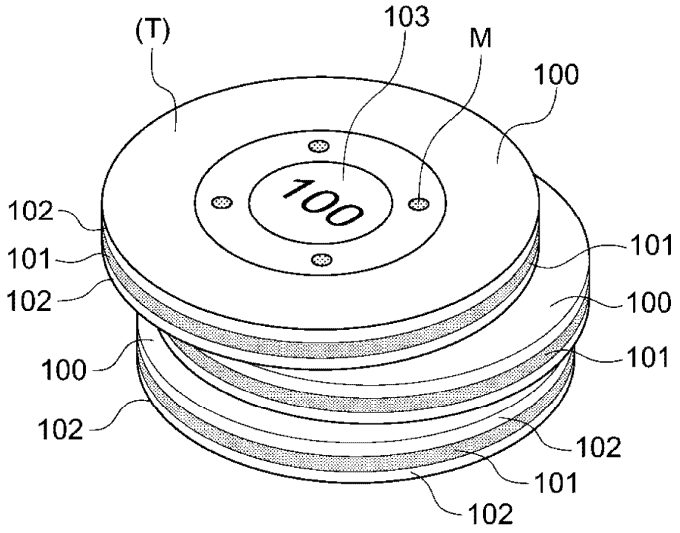

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Fig. 5A

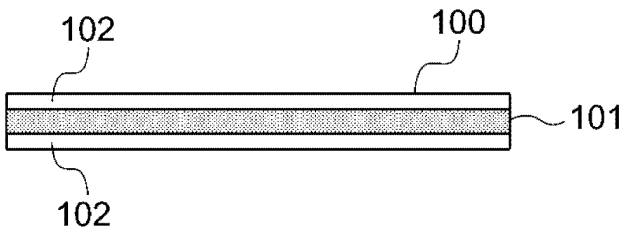

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Fig. 5B

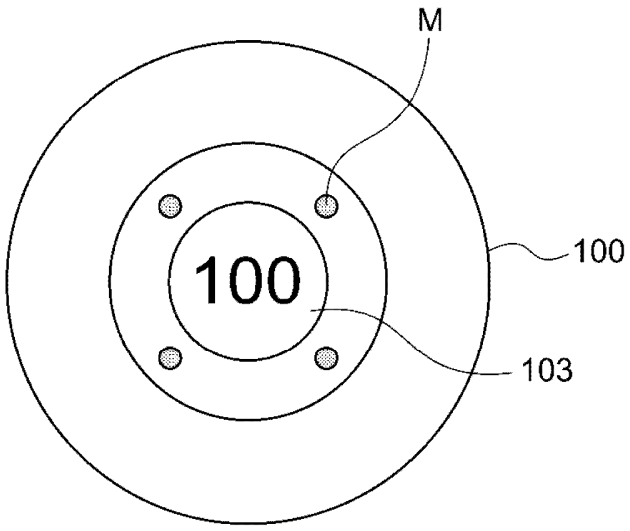

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Fig. 6

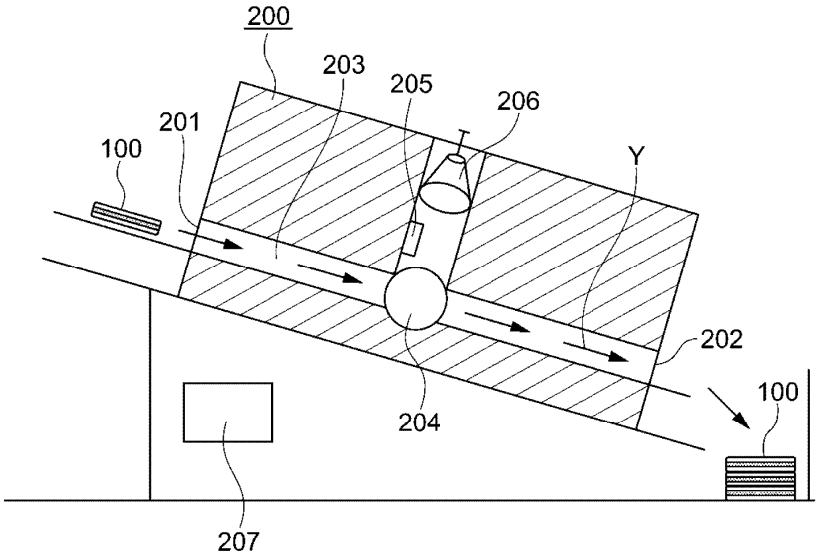

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Fig. 7