

DICE BOUNCING APPARATUS

1. Field of Invention

The present invention relates to an automatic dice bouncing apparatus.

2. Description of the Related Art

Electric dice gaming apparatuses are very popular in Casino. In general, an electric dice gaming apparatus generates results with using a random number generator (RNG), where the RNG is commonly a software program installed inside the electric dice gaming machine and the results are shown on a screen. Player bets wagers on preferred results to participate the game. However, the player is not capable of exactly seeing process for generating the results, so that player may not trust in the results and is discouraged to bet more wagers.

To resolve the disadvantage described above, a dicing machine is provided with a cage comprises multiple dice therein. The cage is controlled by the dicing machine and is rolled or moved to randomly change pits of the dice contained inside. However, these dicing machines use quite different ways (roll or move) to change the dice pits, that is totally different from the conventional way dicing the dice (up and down) thereby decrease interests in playing the game.

The present invention provides a dice bouncing apparatus to obviate or mitigate the shortcomings of the conventional dicing machines.

The primary objective of the present invention is to provide a dice bouncing apparatus having a dicing shaker, the dicing shaker is moved up and down quickly to change the pits of the dice randomly.

The dice bouncing apparatus in accordance with the present invention

has a bracket, a dicing module and an activator. The dicing module has a dicing module bracket and a dicing shaker. The dicing module bracket is securely mounted on the bracket. The dicing shaker is moveably mounted on the dicing module bracket, contains multiple dice thereon and is capable of lifted frequently up and down to change pits of the dice. The activator is mounted on the bracket adjacent to the dicing shaker and activates the dicing shaker lifting up and down.

Other objectives, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

IN THE DRAWINGS

Fig. 1 is a perspective view of a dice bouncing apparatus in accordance with the present invention;

Fig. 2 is an exploded perspective of the dice bouncing apparatus in Fig. 1;

Fig. 3 is a side view in partial section of a vibration insulator of the dice bouncing apparatus in Fig. 1;

Fig. 4 is a partial perspective view of a dicing machine with the dice bouncing apparatus in Fig. 1;

Fig. 5 is an operational side view in partial section of the dice bouncing apparatus in Fig. 4;

Fig. 6 is an operational side view in partial section of the dice bouncing apparatus in Fig. 4, shown a dicing shacking is pulled down; and

Fig. 7 is an enlarged perspective view of a second embodiment of a sensing module in accordance with the present invention.

With reference to Figs. 1 and 2, a dice bouncing apparatus in accordance with the present invention comprises a bracket (10), a dicing module (30), an activator (20) and may have a vibration generator (40).

The bracket (10) has a base (12), a top frame (16) and multiple vibration insulators (14).

The base (12) may be a circular or a rectangular board and has a top surface and a bottom surface.

The top frame (16) has a size corresponding to the base (12) and is disposed above the base (12).

With reference to Fig. 3, the vibration insulators (14) are separately mounted between the base (12) and top frame (16) to reduce or absorb vibrations from the base (12) to the top frame (16) and vice versa. In a preferred embodiment of the present invention, four vibration insulators (14) are mounted separately on the top surface of the base (12), each vibration insulator (14) comprises a bottom container (141), a container resilient device (142), a bottom brace (143), an elastic disc (144), a support disc (145), a bottom resilient device (146), a universal connector (147), a top brace (148) and a top resilient device (149).

The bottom container (141) is mounted securely on the bottom surface of the base (12).

The container resilient device (142) is movably disposed inside the bottom container (141) and may be a spring corresponding to and allocated inside the bottom container (141).

The bottom brace (143) is rod-like and has a first end and a second end.

The first end of the bottom brace (143) is movably mounted through the base (12) inside the bottom container (141) and is capable of restitution in a specific position inside the bottom container (141) by the container resilient device (142). In the preferred embodiment of the present, the container resilient device (142) is partially mounted surrounding the bottom brace (143) and is limited between the bottom surface of the base (12) and a head of the bottom brace (143) so that the bottom brace (143) is restituted by the container resilient device (142).

The elastic disc (144) is mounted on the top surface of the base (12) adjacent to or surrounds the bottom brace (143).

The support disc (145) is deposited above the elastic disc (144).

The bottom resilient device (146) is a spring mounted around the bottom brace (143) on the support disc (145).

The universal connector (147) is securely connected coaxially on the bottom brace (143) and has at least one pivoting dimension and may have a protection cover (1471) that is mounted around the universal connector (147) and prevents damages by dirt or moisture.

The top brace (148) is securely connected coaxially on the universal connector (147) and has a distal end. The distal end is mounted in the top frame (16) and has a head limited inside the top frame (16).

The top resilient device (149) is mounted around the top brace (148) between the top frame (16) and the universal connector (147) and may be a spring.

The dicing module (30) has a dicing module bracket (32) and a dicing shaker (34). The dicing module bracket (32) may be a rectangular frame and is

mounted on the top surface of the base (12). The dicing module bracket (32) has a side surface, a side opening and a rail (324). The side opening is formed through the side surface of the dicing module bracket (32). The rail (324) is securely mounted inside the dicing module bracket (32) at a position corresponding to the side opening.

The dicing shaker (34) is movably mounted through the dicing module bracket (32) and has a dice shaft (342), a restitution device (344), a clamp (346), a sliding mount (347) and a dicing stub (348).

The dice shaft (342) has a dice holder (3422) and a shaft body (3424). The dice holder (3422) contains dice thereon and may be circular or polygonal.

The shaft body (3424) is slidably connected to the rail (324) and has a proximal end and a distal end. The proximal end of the shaft body (3424) is coaxially formed perpendicularly on the dice holder (3422). The distal end of the shaft body (3424) is movably mounted through the dicing module bracket (32) and is connected slidably to the rail (324).

The restitution device (344) is mounted between the dice holder (3422) and the dicing module bracket (32), restitutes the dice holder (3422) remaining at a specific position after dice holder (3422) moved, and may be a spring mounted on the shaft body (3424).

The clamp (346) is mounted securely on the shaft body (3424) at the distal end of the shaft body (3424).

The sliding mount (347) is securely mounted on the clamp (346) and is slidably mounted onto the rail (324), such that the distal end of the shaft body (3424) is slidably connected to the rail (324) by the clamp (346) and the sliding

mount (347).

The dicing stub (348) is securely mounted with the clamp (346). In the preferred embodiment of the present invention, the dicing stub (348) is transversely mounted on the clamp (346).

With further references to Figs. 1, 2 and 7, the activator (20) has an activator bracket (21), an activator body (22), a bouncing device (26) and a sensing module (28, 28A).

The activator bracket (21) is mounted on the base (12) adjacent to the dicing module (30).

The activator body (22) may be a stepper motor, a servomotor or the like, is securely mounted with the base (12) (may be directly mounted on the base (12) or on the activator bracket (21)) and has a rotational shaft (24). In the preferred embodiment of the present invention, the activator body (22) is mounted securely on the activator bracket (21) and the rotational shaft (24) is rotatably mounted through the activator bracket (21) and is disposed at a position corresponding to the dicing stub (348).

The bouncing device (26) is disc-like, is securely mounted on the rotational shaft (24) and has multiple dicing tabs (262).

The dicing tabs (262) are separately formed radially from the bouncing device (26), are successively moved into the dicing module bracket (32) from the opening when the rotational shaft (24) rotating and are capable of leaning against to the dicing stub (348) to lift the dicing shaker (34). Each dicing tab (262) is selectively pressing the dicing stub (348) to pull down the dice shaft (342) and compress the restitution device (344) after the rotational shaft (24) is rotated.

The dice shaft (342) is thereby pushed back by the restitution device (344) after the pressed dicing tab (262) leaving from the pressing dicing tab (262). When the activator body (22) continuously rotates the rotational shaft (24), the dicing tabs (262) successively activate the dice shaft (342) one by one to randomly roll the dice placed on the dice holder (3422). In a preferred embodiment of the present invention, the bouncing device (26) has three dicing tabs (262).

The sensing module (28, 28A) is an optoelectrical sensing module that is able to detect times of the dice shaft (342) being struck by the dicing tabs (262). The sensing module (28, 28A) has an optical sensor (282, 282A) and a masking device (281, 281A).

The optical sensor (282, 282A) is mounted securely on the dicing module bracket (32) or on the activator bracket (21) and senses a variation of emitted light therefrom to determine whether the dicing tabs (262) are activated. In the preferred embodiment of the present invention, the optical sensor (282) is mounted on the activator bracket (21) near the rotational shaft (24). In a second embodiment of the present invention as shown in Fig. 7, the optical sensor (282A) is securely mounted on the dicing module bracket (32).

The masking device (281, 281A) may be a non-transparent plate or a transparent plate and has at least one inverse section (2811, 2811A).

The at least one inverse section (2811, 2811A) is formed on the masking device (281, 281A), each has different light transmittable property from that of the other parts of the masking device (281, 281A) and each forms the variation of the emitted light from the optical sensor (282, 282A). In the preferred embodiment of the present invention, the masking device (281) is a non-

transparent disc, is coaxially mounted securely on the rotational shaft (24) adjacent to the optical sensor (282) and has three inverse sections (2811) that are transparent holes and are respectively formed through the masking device (281). Therefore, the emitted light from the optical sensor (282) is normally blocked by the masking device (281) and the variation of the emitted light detected by the optical sensor (282) comes up one by one by the successively passed inverse sections (2811).

In a second embodiment of the present invention as shown in Fig. 7, the masking device (281A) is a rod having a protruding non-transparent tab as the inverse section (2811A), is mounted on the dicing shaker (34) and is disposed at a position corresponding to the optical sensor (282A) mounted on the dicing module bracket (32). Therefore, the variation of the emitted light detected by the optical sensor (282A) comes up since the emitted light is blocked by the inverse section (2811A) when the dicing shaker (34) is pulled down. Furthermore, in the second embodiment of the present invention, the sensing module (28A) is able to check whether the dicing shaker (34) is activated consistency with the rotational shaft (24) to conform functions of the bouncing device (26). For example, an external server (not shown) may read signals from the sensing module (28A) to check the function of the dicing shaker (34) after activate the activator (20) and to monitor components such as the restitution device (344).

The vibration generator (40) is mounted with the dicing module (30) and generates a vibration for the dicing module (30) after the activator (20) finishing dicing to prevent dice stacked to each other. The vibration generator (40) has a generator body (42) and an eccentric disc (44). The generator body (42) is

mounted securely on the dicing module bracket (32) and has an axis. The eccentric disc (44) is non-coaxially mounted securely on the axis of the generator body (42). Hence, when the generator body (42) is activated to rotate, the eccentric disc (44) is rotated off-axially and generates vibration.

With reference to Figs. 4, 5 and 6, the dice bouncing apparatus may be mounted at a center of a Sic-bo gaming machine (92), where the Sic-bo gaming machine (92) may have a table, an interior translucent cap (94) and an outer cap (96). The interior translucent cap (94) is securely mounted on the table of the Sic-bo gaming machine (92). The outer cap (96) is non-transparent, is movably mounted on the table of the Sic-bo gaming machine (92) to cover the interior translucent cap (94) and is capable of lifting from the table to reveal the interior translucent cap (94). The top frame (16) is securely installed above the table, thereby the dice holder (3422) corresponds to and is movably mounted in the interior translucent cap (94). Players sit around the Sic-bo gaming machine (92) when join Sic-bo games. In general, three dice are placed on the dice holder (3422) and are randomly rolled by the dice holder (3422) when the dice shaft (342) is activated by the activator (20) after the outer cap (96) covers the interior translucent cap (94). Then, the outer cap (96) is lifted and reveals the dice to the players after a betting time is expired.

As described above, the dicing shaker (34) is moved up and down quickly to change pits of the dice, which is consisted with conventional way. Furthermore, a useful life of the apparatus is prolonged since vibration sources such like the dicing module (30), the activator (20) and the vibration generator (40) are isolated to each other by the vibration insulators (14).

Even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only. Changes may be made in detail, especially in matters of shape, size and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

WHAT IS CLAIMED IS:

1. A dice bouncing apparatus comprising:

a bracket (10) having a base (12) having a top surface and a bottom surface;

a dicing module (30) having

a dicing module bracket (32) being mounted on the top surface of the base and having

a side surface;

a side opening being formed through the side surface of the dicing module bracket (32); and

a rail (324) being securely mounted inside the dicing module bracket (32) at a position corresponding to the side opening; and

a dicing shaker (34) being movably mounted through the dicing module bracket (32) and having

a dice shaft (342) having

a dice holder (3422) containing dice thereon; and

a shaft body (3424) being slidably connected to the rail (324) and having a proximal end and a distal end, the proximal end of

the shaft body (3424) being coaxially formed perpendicularly on the dice holder (3422), the distal end of the shaft body (3424) being movably mounted through the dicing module bracket (32) and being connected slidably to the rail (324);

a restitution device (344) being mounted between the dice holder (3422) and the dicing module bracket (32), restituting the dice holder (3422) remaining at a specific position after dice holder (3422) being moved;

a clamp (346) being mounted securely on the shaft body (3424);

a sliding mount (347) being securely mounted on the clamp (346) and being slidably mounted on the rail (324); and

a dicing stub (348) being securely mounted on the clamp (346); and

an activator (20) having

an activator bracket (21) being mounted on the base (12) adjacent to the dicing module (30);

an activator body (22) being mounted on the activator bracket (21) and having a rotational shaft (24) that is rotatably mounted through the activator bracket (21);

a bouncing device (26) being disc-like, being securely mounted on the rotational shaft (24) and having multiple dicing tabs (262), the dicing tabs (262) being separately formed radially from the bouncing device (26), being successively moved into the dicing module bracket (32) via the opening when the rotational shaft (24) rotates and being capable of leaning against the dicing shaker (34), each dicing tab (262) selectively pressing the dicing stub (348) to pull down the dice shaft (342) and to compress the restitution device (344) after the rotational shaft (24) has been rotated; and

a sensing module (28A), the sensing module (28A) being an optoelectrical sensing module that is able to detect times of the dice shaft (342) being struck by the dicing tabs (262) and has

an optical sensor (282A) being mounted securely on the dicing module bracket (32) and senses a variation of emitted light therefrom; and

a masking device (281A) having an inverse section (2811A), where the masking device (281A) is a rod having a protruding non-transparent tab as the inverse section (2811A) and the masking device (281A) is mounted on the dicing shaker (34) and corresponds to the optical sensor (282A)

to form the variation of the emitted light when the inverse section (2811A) passes through the optical sensor (282A).

2. The dice bouncing apparatus as claimed in claim 1, wherein the dice bouncing apparatus further has a vibration generator (40), the vibration generator (40) is mounted with the dicing module (30) and generates a vibration for the dicing module (30).

3. The dice bouncing apparatus as claimed in claim 2, wherein the vibration generator (40) has

a generator body (42) being mounted securely on the dicing module bracket (32) and having an axis; and

an eccentric disc (44) being non-coaxially mounted securely on the axis of the generator body (42).

4. The dice bouncing apparatus as claimed in claim 1 or 2 or 3, where the bracket (10) further has

a top frame (16) being disposed above the base (12); and

multiple vibration insulators (14) being separately mounted between the base (12) and top frame (16) to reduce or absorb vibrations between the base (12) and the top frame (16).

5. The dice bouncing apparatus as claimed in claim 4, where each vibration insulator (14) comprises

- a bottom container (141) being mounted securely on the bottom surface of the base (12);
- a container resilient device (142);
- a bottom brace (143) being rod-like and having
 - a first end being movably mounted through the base (12) inside the bottom container (141) and being capable of restitution in a specific position inside the bottom container (141) by the container resilient device (142); and
 - a second end;
- an elastic disc (144) being mounted on the top surface of the base (12) surround the bottom brace (143);
- a support disc (145) being deposited on the elastic disc (144);
- a bottom resilient device (146) mounted around the bottom brace (143) on the support disc (145);
- a universal connector (147) being securely connected coaxially on the bottom brace (143) and having at least one pivoting dimension;

a top brace (148) being securely connected coaxially on the universal connector (147) and having a distal end, the distal end being mounted in the top frame (16) and having a head limited inside the top frame (16); and

a top resilient device (149) being mounted around the top brace (148) between the top frame (16) and the universal connector (147).

6. The dice bouncing apparatus as claimed in claim 5, where the universal connector (147) has a protection cover (1471) being mounted around the universal connector (147).