Dynamically Altering Pinball Playfield Elements

ABSTRACT

The present invention teaches systems and methods to dynamically alter pinball playfield elements. The key observation is that these systems and methods are organic to conventional pinball play, and thus acceptable to a typical pinball player. The present invention has two broad components under control of a game's processor. One, physically moving a playfield component such as a bumper, and two, changing the force of a playfield component, such as an angle bumper kicker or flipper.
Post Adjustment
C - Conservative
M - Medium
L - Liberal

RUBBER RINGS
R1-7A-120-031 R6-7A-120-150
R2-7A-125 R7-7A-120-200
R3-7A-121-W R8-7A-120-250
R4-7A-120-100 R9-7A-120-300
R5-7A-120-125

BALL GUIDES & ROLL-OVERS
W1-A-149 W5-A-630
W2-A-383 W6-6A-253-R
W3-6A-101 W7-6A-253-L
W4-C-628

PLASTIC SHIELDS
TOP ARCH SET 13C-113-1R & 1L
METEOR SET 13C-113-2- to - 9

MISC. PARTS & ASSEM.
1. 6-BANK TARGET D-548-6A
2. 3-BANK TARGET D-580-1 to 3
3. THUMPER CAP 4A-134-R
4. BUMPER CAP 13A-32-1 & 3
5. ROLL-OVER BUTTON 49-275
6. TARGET ASSY A-461-2Y
7. BALL GATE, RIGHT A-104-R2
8. REBOUND RUBBER A-105
9. BALL GATE POST 2A-200
10. SPIN TARGET A-563-9
TARGET & WIRE ONLY 14A-7-8
11. FLIPPER & SHAFT A-193
12. INSTRUCTION PLATE 14B-3-2
13. SHOOTER GAUGE 14A-2-5

Figure 3
DYNAMICALLY ALTERING PINBALL PLAYFIELD ELEMENTS

RELATED APPLICATIONS

This application claims priority under 35 U.S.C. §119 based on U.S. Provisional Application No. 60/975,666, filed Sep. 27, 2007, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

The present invention relates to amusement games such as pinball and pachinko machines and, more specifically, to dynamically altering playfield elements.

As is well known, pinball games typically comprise an inclined playfield mounted in a cabinet and supporting a rolling ball. Players control the game ball with flippers to score points by projecting the ball towards game features, such as targets, bumpers, and the like. Conventional pinball games provide the player with a predetermined number of game balls that are played on the game playfield.

Over the years pinball machines have lost space in arcades and location-based entertainment centers to video arcade games. In 1931 Baffle Ball (D. Gottlieb & Co.) sold 50,000 units. That same year Ballyhoo (Bally Mfg.) sold 75,000 units. In contrast, the only surviving pinball manufacturer Stern Pinball is “striving towards 10,000 machines a year.” One of the major reasons for this decline is game-play time. Video arcade games have an operator-settable gameplay time. Pinball gameplay time is typically solely related to a player’s skill.

Pinball games derive their appeal from the challenge they present to game players. Players are rewarded for skillful play with bonuses, extended game play, and free games. Usually, skillful play requires a significant investment of time and expense before the new player becomes familiar with the particular scoring scheme and game features and develops the eye-hand coordination to control the ball and hit the desired targets. Game appeal thus depends on a player’s willingness to learn the game. Often, a novice player with little skill and experience will quickly drain all of the game balls and experience an unexciting, short-lived game play. He or she may become intimidated and quickly lose interest in that particular pinball game or in pinball games in general.

Thus, in order to permit players to develop their skills and maintain interest in a particular pinball game, it is desirable to provide new players with the option to learn and master a particular pinball game at a more reasonable cost. At the same time, the skilled player may become bored with a game that is “too” easy and doesn’t provide enough challenge to keep him interested.” (Sullivan, U.S. Pat. No. 5,707,059)

As a game becomes skilled with a particular pinball machine, its gameplay time increases. This decreases potential revenue from a machine. All amusement games are often subject to a queue. One skilled individual may tie up a pinball machine for 30 minutes or more, on one play. Unlike waiting to play a video arcade machine, the wait for a pinball machine may be long and variable, thus causing an individual to lose interest in a particular machine or in pinball in general.

One method of adjusting a pinball machine’s difficulty is the position of posts. Many machines were built with multiple positions for posts. For example, a post near an out-hole typically has three positions, conservative, medium and liberal. (FIG. 3) The position of this post determines how likely a pinball would exit through the out-hole or bounce back into the playfield. Thusly the machine’s difficulty level could be set, but only by a trained operator while the machine was being serviced.

One solution to the problem of pinball game-time being to short is addressed by Sullivan, et al. U.S. Pat. No. 5,707,059 that teaches a “novice” mode where game-time is determined by a timer and not by a pre-determined number of balls. Sheats, Jr. U.S. Pat. No. 6,149,153 teaches helping novices by having the processing circuit activate a flipper, to show the novice where the “money” shots are and to help his or her score. However this solution changes fundamental gameplay.

Accordingly, there is a need for dynamically altering pinball playfield elements for the purpose of controlling gameplay time while not significantly changing the conventional gaming experience.

SUMMARY OF THE INVENTION

The present invention teaches dynamically altering pinball playfield elements. Two broad categories are discussed:

- Physically moving a playfield component, such as a bumper, and
- Changing the force of a playfield component, such as an angle bumper kicker or flipper.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate the invention and, together with the description, explain the invention. In the drawings,

FIG. 1 is a representation of a playfield with a hole drilled in it.

FIG. 2 is a representation of an angle bumper at multiple angles.

FIG. 3 is an image showing “Meteor” playfield parts.

FIG. 4 is an image showing “Meteor” playfield parts with playfield parts that could be adjusted by the methods taught in the current invention marked.

DETAILED DESCRIPTION

The following detailed description of the invention refers to the accompanying drawings. The same reference numbers in different drawings identify the same or similar elements. Also, the following detailed description does not limit the invention. The term processor is used for convenience and does not imply a specific type of microcontroller. Circuitry may be used to produce processor like functions.

The following description describes a basic embodiment of our invention.

There are a number of different playfield elements that may be dynamically altered in order to affect game play in a pinball machine. As previously mentioned, early attempts at modifying game play required operator intervention and skilled technicians in order to make the change (see FIG. 3).

The present invention creates playfield elements that may be dynamically changed as a game is being played. These elements may be controlled by the computer tasked
with operating the pinball machine or they may be changed based on sensor data of the element itself.

[0024] For the sake of this discussion, we will be talking about the angle bumpers typically found near the flippers at the bottom of the playfield. The term solenoid is used to describe the actuator typically used to impact a ball, but the invention is in no way limited to this device. In a typical pinball machine, a mechanical switch is positioned just behind the rubber bumper to determine when the ball has come in contact with the bumper. The switch closure is used either directly or indirectly to apply power to the solenoid that will propel the ball away from the bumper.

[0025] The present invention does not require any coupling between the switch and the solenoid, meaning that the switch has no restrictions as to its ability to carry power. As such, the switch is not limited to being a mechanical switch, but may be optical, hall effect, or even a virtual switch. Examples of a virtual switch would include the ball position determined by video analysis or an array of sonar transducers on the playfield.

[0026] Given that the switch or imminent contact information is not used directly to power the solenoid, the machine's processor controls the amount of power applied to the solenoid. This allows for a significant change in the way the bumper works. With a mechanical switch, a glancing strike on the bumper would cause only a low power response from the solenoid, as the ball would not be in contact with the switch for long. With the present invention, a full power stroke may be applied to the solenoid, giving the ball more of a kick than would be expected. Conversely, if the processor decides to make a bumper "dead", it can give a very low power kick even in the case of a solid hit on the switch.

[0027] Additionally, the present invention is not restricted to being fully reactive as is a typical pinball machine. Using sensors and taking advantage of the onboard processing abilities, the machine may be proactive in its response to the ball. For instance, if the machine determines that the ball will strike one of the angle bumpers, it can send the solenoid in motion in advance of the ball reaching the bumper. This allows for a more powerful kick using the same solenoid.

[0028] A mechanical system, by the time the solenoid is in motion, the ball has already begun to slow. By predicting the impact, the optimal impact timing and velocity can be chosen by the processor.

[0029] In the preceding example we touched on the benefits of being able to adjust the power to a given solenoid under processor control. This also applies to the solenoid that drives the flippers. When the player presses a flipper button, power is typically directly coupled from the button to the solenoid. If the player taps the button, the flipper will have just a light bounce. If the player holds the button, the flipper will have full power and remain in the extended position. In the current invention, the processor may decide to decouple the flipper buttons and the flipper solenoids. This allows a great amount of flexibility in dynamically changing gameplay. By changing the amount of time that power is applied to the solenoid when a flipper button is pressed, the processor can increase or decrease the strength of the flippers. The processor can also release the flippers after a specific amount of time, preventing the player from holding onto a ball forever. One skilled in the art would understand that these techniques would give the processor an unprecedented amount of control over aspects of gameplay that had formerly been passive.

[0030] The present invention is not limited to adjusting the power of the standard elements on the pinball playfield, it also provides for dynamically moving playfield elements. Going back to the angle bumper example, many older pinball machines had multiple holes drilled into the playfield in the area where a post may be positioned (see FIG. 3). A technician could modify the game's difficulty by moving the post to one of the other positions.

[0031] FIG. 2 is a representation of an angle bumper. In this example the angle bumper may be at an angle of 45 degrees or an angle of 50 degrees. With proper game design, changing the angle of an angle bumper can affect gameplay, with one setting harder than another. Alone or in combination with changing the force of the kicking mechanism associated with the angle bumper, gameplay difficulty can be adjusted.

[0032] In pinball games such as "Klondike" and "Heat Wave" a pinball can drain in the space between the angle bumper and the edge of the playfield. On machines such as these an angle bumper at 45 degrees would have a smaller space for a ball to drain than an angle bumper at 50 degrees.

[0033] Three are three broad categories to consider when moving features on a pinball machine:

- [0034] Stability
- [0035] Positioning
- [0036] Cost

[0037] Stability. A feature that is moved must not be knocked out of position by a pinball striking it. To this end a feature may be attached to a motor with a worm gear, or a feature may be mounted to a plate and the plate with feet for stability, the plate moved by an actuator, among other methods known in the art. Additionally the feature or plate may use pins to help stabilization.

[0038] Positioning. For exact positioning a system of pins described below can be used. Additionally physical blocks can be used to stop plate movement, help stabilize and position. Other systems include using a stepper motor, a worm gear, among other methods known in the art.

[0039] Cost. Cost both in production and cost of maintenance must be considered. For example most pinball playfield features could be moved with a heavy motor driving a worm gear. However in moving a single post such as 409 this would be overkill. A single post could be more economically moved by a system such as one using muscle wires. Additionally bell cranks and similar devices known in the art may be used to multiply the force of an actuator.

[0040] The current invention allows the processor to change the position of bumpers during game play. In one embodiment, a motor with a worm gear is attached to the playfield and is used to move the post on an angle bumper. A
slot is milled in the playfield allowing the post to travel a short but significant distance. The position of the post may be determined in any number of ways, ranging from using a stepper motor and counting the steps moved to using standard servo feedback techniques. Additionally, end of travel switches may be used to avoid overdriving the motor.

[0041] In another embodiment, muscle wire is used to move the post from one location to the next. Motors are preferable in some situations due to the flexibility in positioning that they provide, but muscle wire provides a very low cost way to occasionally move a post.

[0042] An actuator would not necessarily be connected directly to a post, but could attach to a plate to which the post is attached. The plate can have additional support hardware underneath the playfield to give the post the necessary rigidity for pinball play while allowing for smooth movement. This support could include Teflon coated “feet” to allow for stability and ease of motion.

[0043] In another embodiment, holes are drilled into the playfield 101 corresponding to desired stopping location for the motion plate. A spring loaded pin 102 is used to secure the plate to the hole. When the plate is to be put into motion, muscle wire is used to raise the pin out of its hole, the plate moves, and the muscle wire releases the pin. This allows for a way to strongly secure the plate when it reaches a predetermined stopping point. In another embodiment, the holes that are used for the pin are filled with an insert harder than wood, typically of metal, that is wider on the top narrowing down to a close fit for the pin 103. This insert makes it easier for the pin to hit the hole and reduces wear on the playfield.

[0044] One skilled in the art would appreciate that these techniques can be used with many of the elements typically found on pinball machines. Using the same techniques taught above, many features can be adjusted to have an impact on game play. For some examples, please refer to FIG. 4. 401-412 are examples of posts that can be moved to change game play. 420 is a flipper whose angle relative to the drop target bank above it could be changed. 430 is a pop bumper that could be moved to affect game play.

[0045] With the proper application of these techniques, a pinball machine is changed from being a passive, reflexive device to one that has an active playfield. With so many elements under the control of the machine’s processor, it is possible to have the machine interact with the player in ways that were never before possible. Please see U.S. patent application “SYSTEMS AND METHODS FOR ADJUSTING GAME-PLAY TIME OF PINBALL MACHINES” by the inventors.

[0046] No element, act, or instruction used in the description of the present application should be construed as critical or essential to the invention unless explicitly described as such. Also, as used herein, the article “a” is intended to include one or more items. Where only one item is intended, the term “one” or similar language is used.

[0047] The scope of the invention is defined by the claims and their equivalents.

What is claimed:
1. A pinball game comprising
   a) an inclined playfield having a plurality of game features and supporting a rolling game ball thereon;
   b) logic and circuitry for controlling the function of said game, including:
      (i) means for dynamically altering playfield;
      (ii) means for changing power level to one or more said game feature during game play.

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