

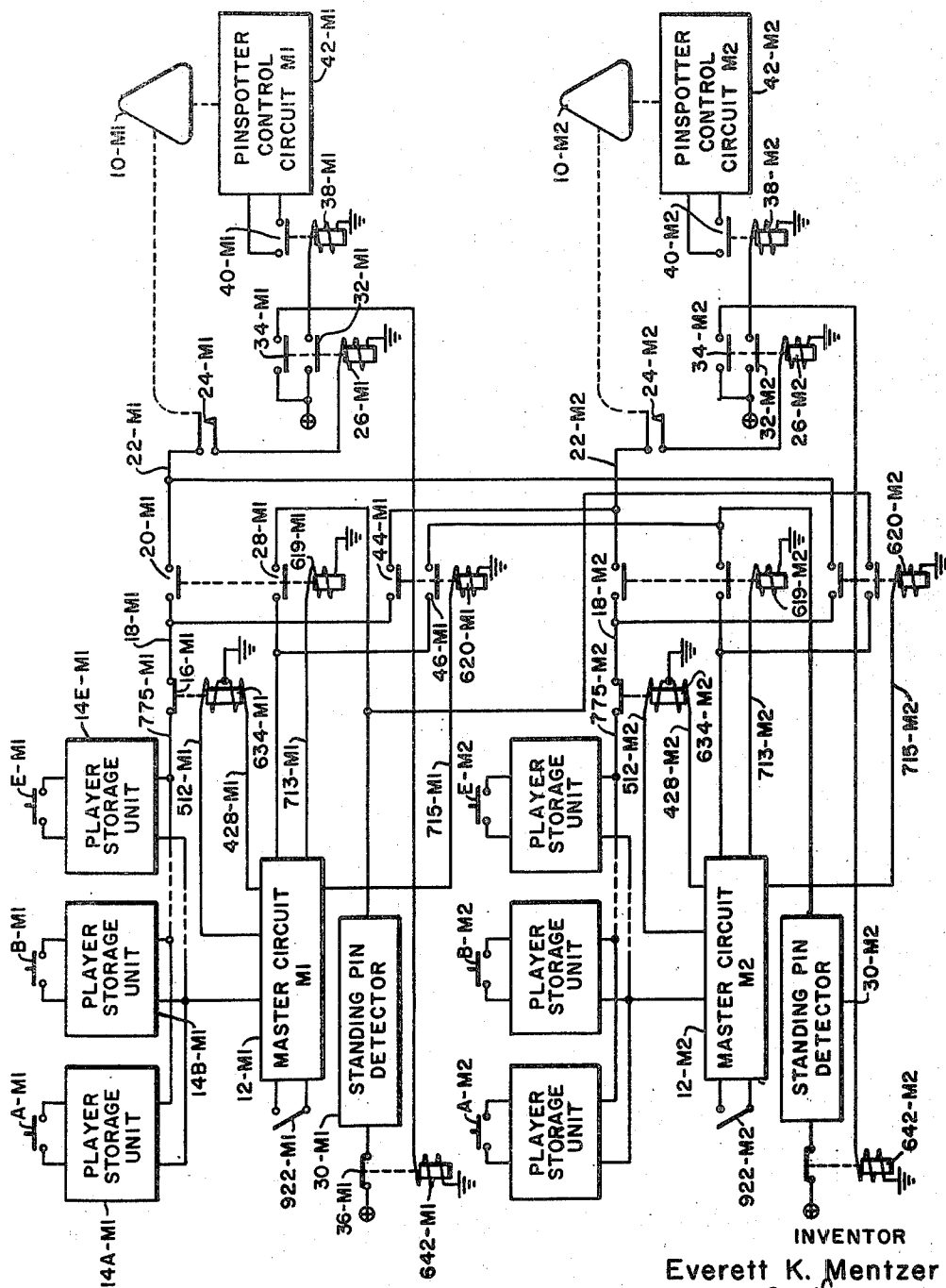
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BOWLING ALLEY PIN-SPOTTER CONTROL

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BOWLING ALLEY PIN-SPOTTER CONTROL

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This invention relates to a control system for an automatic bowling alley pin-spotter, and more particularly to a control of the type described which is incorporated into a system for automatically detecting pinfall and for totalizing and registering the score in a bowling game.

As is known, automatic bowling alley pin-spotters operate in accordance with either a first ball or a second ball cycle. In the first ball cycle, the pin-spotter frame is initially lowered and is provided with gripper arms or the like which grip the pins remaining after the first ball delivery, whereupon the pin-spotter frame is elevated to raise the standing pins to permit the sweep arm of the assembly to remove the "deadwood" from the alley (i.e., push the fallen pins back into the bowling alley pit where they are picked up by the pin-spotter preparatory to a succeeding pin-spotting operation). Thereafter, the pin-spotter frame is lowered and the gripper arms or the like released to reset the pins left standing after the first ball. If a strike is made on the first ball of a frame, this condition is sensed by failure of the gripper arms to grasp any pins, whereupon the second ball cycle for that frame is eliminated and the pin-spotter resets all ten pins preparatory to the succeeding frame.

The first ball cycle outlined above is usually initiated by a limit switch or the like which closes when the first ball of a bowling game frame strikes the alley backstop. Likewise, the second ball cycle is initiated by closure of this same limit switch when the second ball of a frame strikes the backstop, assuming that a strike has not been made with the first ball. In the second ball cycle, the pin-spotter frame is not lowered to pick up any standing pins as in the first ball cycle. Rather, the sweep arm removes all pins, including those standing as well as any fallen pins. Finally, the pin-spotter frame, loaded with ten pins, is lowered to set all pins preparatory to the succeeding frame.

In the first ball cycle, the pin-spotter control circuitry is conditioned for a second ball cycle, assuming that a strike has not been made. Similarly, after the second ball cycle is completed, the control circuitry is conditioned for the first ball cycle of the next frame. Thus, the first and second ball cycles of the pin-spotter follow in succession in accordance with a predetermined sequence. In the tenth frame of a game, however, a bowler may be entitled, according to the rules of the American Bowling Congress, to three balls rather than the usual two. Accordingly, if three balls are delivered in the last frame and if less than ten pins are knocked down with the third or last ball, the pin-spotter will "assume" that its next cycle of operation should be a second ball cycle. Since, however, the game is completed upon the delivery of the third ball in the tenth frame, the pin-spotter should be conditioned for a first ball cycle. In the past, this condition has been handled by providing a manually operable switch which must be closed to cycle the pin-spotter through a second ball cycle whenever pins remain standing after the delivery of the third ball in the tenth frame.

As an overall object, the present invention seeks to provide apparatus for automatically cycling the pin-spotter through a second ball cycle after the delivery of the third ball in the tenth frame of a game and before the next bowler in a game delivers a ball.

More specifically, an object of the invention is to provide apparatus of the type described which is used in con-

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junction with automatic totalizing and scoring circuitry for a bowling game.

The above and other objects and features of this invention will become apparent from the following detailed description taken in connection with the accompanying single figure drawing which forms a part of this specification.

Referring now to the drawing, the invention is shown in connection with pin-spotters on adjacent bowling alleys referred to herein as M1 and M2, respectively. The pin-spotters themselves are schematically illustrated in the drawing and identified by the numerals 10-M1 and 10-M2. Each adjacent bowling alley is provided with an automatic scoring, totalizing and printing system including a master circuit 12-M1 or 12-M2. The master circuit 12-M1, for example, is equipped with a plurality of player storage units 14A-M1 to 14E-M1 as well as a standing pin detector 30-M1, hereinafter described. The master circuit 12-M2 is equipped with similar circuits as shown. A full and detailed description of the master circuits 12-M1 and 12-M2 and their associated circuits may be had by reference to copending Application Serial No. 175,865, filed February 9, 1962, now U.S. Patent No. 3,124,355, issued March 10, 1964. Elements shown in the drawing of the present application which are identified by three-digit numbers are identified by identical three-digit numbers in U.S. Patent No. 3,124,355. The scoring, totalizing and printing system for each adjacent bowling alley is identical as is the pin-spotter control of the present invention. Accordingly, only the circuitry for alley M1 will be described in detail herein, it being understood that the circuitry for the adjacent alley is the same. The only purpose of showing the control systems for two adjacent alleys is due to the fact that in league play, each bowler alternates between adjacent alleys, meaning that there must be some provision for alley switch-over whereby the apparatus for detecting pinfall on adjacent alleys 30-M1 and 30-M2 may be selectively connected to the master circuit of a single scoring, totalizing and printing system.

As was mentioned above, the master circuit 12-M1, for example, is equipped with five player storage units 14A-M1 to 14E-M1, although this number may be increased or decreased, depending upon the requirements. Each player storage unit 14A-M1 to 14E-M1 is provided with a player pushbutton A-M1 and E-M1, the arrangement being such that as each bowler prepares to bowl a frame in a game, he will depress an associated one of the pushbuttons A-M1 to E-M1.

As can be seen from the aforesaid U.S. Patent No. 3,124,355, the master circuit 12-M1, for example, is utilized each time a ball in a bowling game is delivered, regardless of which player pushbutton is depressed. The purpose of the master circuit is to convert the standing pin count at the output of circuit 30-M1 into fallen pin count and to register and totalize the pinfall and any marks achieved in a frame. This information is then applied to a particular player storage unit 14A-M1 to 14E-M1, depending upon which one of the player pushbuttons A-M1 to E-M1 is depressed. Only one player pushbutton will be depressed at any time and only one player storage unit will be connected to the master circuit whereby the pinfall results and information relative to marks for a particular bowler will be transferred to his, and only his, particular player storage unit. The storage units 14A-M1 to 14E-M1, in addition to storing the cumulative frame-to-frame score of each player and his recorded, but unscored marks, also serves to position printing wheels beneath a particular player's line on a translucent or the like score sheet and further serves to direct the printing wheels to the proper frame on the translucent score sheet in which the bowler is playing. The arrangement is such that when the first player de-

presses pushbutton A-M1, for example, the printing wheels will be positioned beneath the first line on the score sheet and at that player's proper frame; when the second player depresses his pushbutton B-M1, the printing wheels will be positioned beneath the second player line at that player's proper frame; and so on. Furthermore, it will be seen by reference to U.S. Patent No. 3,124,355 that when any player pushbutton is depressed, a lead 775-M1 is energized. The lead 775-M1 is connected through normally closed contacts 16-M1 on a first ball latch relay 634-M1 in the scoring circuitry 12-M1 to lead 18-M1. Relay 634-M1 is of the magnetic lock type, meaning that when it is energized through lead 512-M1 from circuit 12-M1, it will break contacts 16-M1 and will be held in that position with contacts 16-M1 broken until its other coil is energized through lead 428-M1 from master circuit 12-M1. When this latter condition occurs, contacts 16-M1 close and remain closed until the lead 512-M1 is again energized. The lead 18-M1, in turn, as adapted to be connected through normally open contacts 20-M1 on an alley connecting relay 619-M1, also described in the aforesaid U.S. Patent No. 3,124,355, to a lead 22-M1. Lead 22-M1, in turn, is adapted to be connected through a normally open cam switch 24-M1 on the pin-spotter 10-M1 to a relay 26-M1. Thus, the relay 26-M1 may be energized when any player pushbutton A-M1 to E-M1 is closed, when the first ball latch relay 634-M1 is deenergized and contacts 16-M1 are closed, when the alley connecting relay 619-M1 is energized to close contacts 20-M1, and when the cam-operated switch 24-M1 on pin-spotter 10-M1 is closed. The cam switch 24-M1 will be closed after the pin-spotter 10-M1 has completed a first ball cycle preparatory to a second ball cycle. Thus, it can be seen that the relay 26-M1 can be energized only when the pin spotter 10-M1 is conditioned for a second ball cycle.

By reference, again, to U.S. Patent No. 3,124,355, it will be seen that when league play is not employed such that bowlers switch from one alley to the other, the relay 619-M1 will be energized each time a bowler depresses his associated pushbutton A-M1 to E-M1. For purposes of simplicity, we will first consider the case where league play is not employed, meaning that relay 619-M1 will be energized and its contacts 20-M1 and 28-M1 closed as each frame is played. When contacts 28-M1 are closed, they connect a standing pin detector 30-M1 to the scoring, totalizing and printing circuitry 12-M1. In U.S. Patent No. 3,124,355, it will be seen that the standing pin detector 30-M1 comprises, in essence, a plurality of coils which are swept across the tops or bottoms of standing pins. Embedded in the top or bottom of each pin is a permanent magnet, the arrangement being such that as the coils sweep across the pins, a number of pulses will be induced corresponding to the number of standing pins. These pulses are applied through contacts 28-M1 of relay 619-M1 to the master circuit 12-M1 where they are converted from the standing pin count into fallen pin count. That is, the number of pulses detected by the standing pin detector 30-M1 are subtracted from ten in circuit 12-M1 to obtain the number of fallen pins.

Reverting again to relay 26-M1 it has two sets of normally open contacts 32-M1 and 34-M1. When contacts 34-M1 close, they energize a relay 642-M1, corresponding to relay 642 shown in the aforesaid U.S. Patent No. 3,124,355 which, when energized, opens contacts 36-M1 to disable or inactivate the standing pin detector 30-M1. Thus, whenever relays 26-M1 and 642-M1 are energized to open contacts 36-M1, no standing pins can be detected.

When contacts 32-M1 on relay 26-M1 are closed, they serve to energize a relay 38-M1 having a pair of normally open contacts 40-M1. When relay 38-M1 is energized and contacts 40-M1 close, the pin spotter 10-M1 is recycled through a pin-spotter control circuit 42-M1.

Let us assume, for example, that a normal frame is being played and that the bowler is preparing to deliver

his first ball of that frame. Initially, the bowler will depress his associated pushbutton A-M1 to E-M1 which will energize relay 619-M1 to close contacts 20-M1 and 28-M1. At this time, the relay 634-M1, which is of the magnetic lock type as mentioned above, will be in position to close contacts 16-M1. Since, however, we are now in a first ball cycle, the cam switch 24-M1 will be open such that relay 26-M1 cannot be energized. After the bowler delivers his first ball in the frame, the master circuit 12-M1 will energize the lead 512-M1 described in the aforementioned U.S. Patent No. 3,124,355 to pull out relay 634-M1, whereupon contacts 16-M1 will open. After the first ball is thus delivered, the pin-spotter frame will be lowered, and if its gripper arms detect any standing pins in accordance with the description given above, it will reset those standing pins and come to rest preparatory to a second ball cycle. At this time, therefore, the cam switch 24-M1 will be closed preparatory to the second ball. Since, however, relay 634-M1 was energized immediately after the first ball was delivered and before the pin-spotter cycled, contacts 16-M1 will be open when switch 24-M1 is closed, such that the relay 26-M1 cannot be energized. After the second ball of a frame is delivered and the pin-spotter cycles through a second ball cycle, the cam switch 24-M1 will open. Also, after the second ball in a frame is delivered, lead 428-M1, described in the aforesaid U.S. Patent No. 3,124,355, will be energized to again pull in relay 634-M1, whereupon contacts 16-M1 will be closed, but only after the cam switch 24-M1 on the pin-spotter 10-M1 has opened so that the relay 26-M1 again cannot be energized.

The foregoing procedure will continue for each of the first nine frames in a bowling game. If, in the tenth frame of a game, the bowler achieves a mark with the first or second ball of the tenth frame, he is entitled to a third or bonus ball for that frame. The procedure outlined above will progress for the first two ball deliveries in the tenth frame. When the third ball of the frame is delivered, however, the pin-spotter 10-M1 will "assume" that it is in a first ball cycle with contacts 24-M1 being open. Upon the delivery of the third ball in the tenth frame, lead 512-M1 will be energized as before to open contacts 16-M1, and after these contacts are opened and the pin-spotter lowered to grip standing pins, the cam switch 24-M1 will close. Since, however, we are now in the tenth frame of the game, two tenth frame relays in master circuit 12-M1, not shown herein, but identified by the numerals 611 and 613 in FIG. 15D of the aforesaid U.S. Patent No. 3,124,355, will be energized whereby lead 428-M1 will also be energized to pull in relay 634-M1 and close contacts 16-M1 at a time which, except for the tenth frame, would be a second ball cycle. Consequently, after the delivery of the third ball in the tenth frame, contacts 16-M1 will be closed, as will switch 24-M1. By the time that the cam switch 24-M1 closes, the master circuit 12-M1 will deenergize lead 713-M1 to deenergize the relay 619-M1 and open contacts 20-M1 and 28-M1. When, however, the next bowler in a game depresses his appropriate pushbutton A-M1 to E-M1, relay 619-M1 will again be energized through lead 713-M1 to close contacts 20-M1, thereby completing a circuit to relay 26-M1 which will become energized to close contacts 34-M1 and 32-M1. Closure of contacts 34-M1 energizes relay 642-M1 to open contacts 36-M1 and prevent the standing pin detector 30-M1 from detecting those pins remaining after the third ball in the tenth frame is delivered. At the same time, closure of contacts 32-M1 will energize relay 38-M1 which, by closure of contacts 40-M1, causes the pin-spotter control circuit 42-M1 to cycle the pin-spotter through a second ball cycle preparatory to a first ball cycle. Thus, notwithstanding the fact that the pin-spotter would normally be in a second ball cycle after the third ball is delivered in the tenth frame of a game, it is automatically cycled through this second ball cycle

by the automatic scoring circuitry to condition the pin-spotter for a first ball cycle preparatory to the next bowler delivering his first ball in a frame.

In the case of league play, the relay 620-M1 is used. As is known, league play requires that each bowler on a team alternate between adjacent alleys as the game progresses. Accordingly, in one frame the master circuit 12-M1 should be connected to the standing pin detector for alley M1, and on the next frame to the standing pin detector for alley M2. Furthermore, the master circuit 12-M1 for alley M1 should alternately control the operation of the pin-spotter on alley M1 and then on alley M2. By reference, again to U.S. Patent No. 3,124,355, in FIG. 14A of that application, it will be seen that there is provided a league play switch 922-M1 in the master circuit 12-M1. When this league play switch is closed, leads 713-M1 and 715-M1 will be alternately energized in successive frames of a game, meaning that in the first frame, for example, circuit 12-M1 will be connected to the standing pin detector 30-M1, and on the next frame it will be connected to standing pin detector 30-M2 for alley M2. Similarly, lead 775-M1 will alternately be connected to lead 22-M1 and then lead 22-M2 in successive frames. The relay 620-M1 is adapted to connect lead 18-M1 to lead 22-M2 through normally open contacts 44-M1. In a similar manner, the standing pin detector 30-M2 is adapted to be connected to the scoring, totalizing and printing circuit 12-M1 through normally open contacts 46-M1. Thus, in league play, the relays 619-M1 and 620-M1 will alternately be energized, thereby alternately connecting circuit 12-M1 to standing pin detectors 30-M1 and 30-M2 and at the same time connecting the player line unit 14-M1 alternately to lead 22-M1 and then lead 22-M2. The result is that in league play the pin-spotter for the alley on which a particular bowler is playing will be controlled in accordance with the frame in which that bowler is playing.

The operation of the circuitry for alley M2 is identical to that for alley M1. When league play is not being employed, relay 619-M2 will always be energized for each frame of the game. However, when league play is employed, the relays 619-M2 and 620-M2 will alternately be energized in the manner described above to effect the alley cross-over arrangement.

The present invention thus provides a means for controlling an automatic pin-spotter in accordance with information received from automatic scoring, totalizing and printing circuitry of the type shown in U.S. Patent No. 3,124,355. Specifically, the invention provides a means for controlling a pin-spotter in accordance with information received from a scoring and totalizing circuit whereby the pin-spotter will be automatically cycled through a second ball cycle after the third ball in the tenth frame of a game. Although the invention has been shown in connection with a certain specific embodiment, it will be readily apparent to those skilled in the art that various changes in form and arrangement of parts may be made to suit requirements without departing from the spirit and scope of the invention.

I claim as my invention:

1. Apparatus for controlling a bowling alley pin-spotter comprising a first switch device which is closed when said pin-spotter has completed a first ball cycle preparatory to a second ball cycle, a second switch device which is closed under the control of a bowler preparing to deliver the first ball in a frame and before that player's first ball in a frame is delivered, and circuit means completed when said first and second switch means are closed to cause said pin-spotter to cycle through a second ball cycle and come to rest preparatory to a first ball cycle.

2. Apparatus for controlling a bowling alley pin-spotter comprising a first switch device which is closed when said pin-spotter has completed a first ball cycle preparatory to a second ball cycle, a second switch device which

is closed under the control of a bowler preparing to deliver the first ball in a frame and before that player's first ball in a frame is delivered, a relay device, circuit means connected through said first and second switch devices for energizing said relay device when said first and second switch devices are closed, and circuit means responsive to energization of said relay device to cause said pin-spotter to cycle through a second ball cycle and come to rest preparatory to a first ball cycle.

3. Apparatus for controlling a bowling alley pin-spotter comprising master circuit means for detecting and registering the pinfall after each ball in a bowling game is delivered, a plurality of player score totalizing and storage units, a plurality of switch devices each of which is adapted to connect an associated one of said totalizing and storage units to said master circuit, first switch means which is closed when said pin-spotter has completed a first ball cycle preparatory to a second ball cycle, second switch means in said master circuit means which is closed when an associated one of said switch devices is closed and before a player's first ball in any frame is delivered, and circuit means operable when said first and second switch devices are closed to cause said pin-spotter to cycle through a second ball cycle and come to rest preparatory to a first ball cycle.

4. Apparatus for controlling a bowling alley pin-spotter comprising master circuit means for detecting and registering the pinfall after each ball in a bowling game is delivered, a plurality of player score totalizing and storage units, a plurality of switch devices each of which is adapted to connect an associated one of said totalizing and storage units to said master circuit, first switch means which is closed when said pin-spotter has completed a first ball cycle preparatory to a second ball cycle, second switch means in said master circuit means which is closed when an associated one of said switch devices is closed and before a player's first ball in any game is delivered, a relay device adapted to be energized when said first and second switch means are closed, and circuit means responsive to energization of said relay device for causing said pin-spotter to cycle through a second ball cycle and come to rest preparatory to a first ball cycle.

5. Apparatus for controlling a bowling alley pin-spotter comprising master circuit means for detecting and registering the pinfall after each ball in a bowling game is delivered, a plurality of player score totalizing and storage units, a plurality of switch devices each of which is adapted to connect an associated one of said totalizing and storage units to said master circuit, first switch means which is closed when said pin-spotter has completed a first ball cycle preparatory to a second ball cycle, second switch means in said master circuit means which is closed when an associated one of said switch devices is closed and before a player's first ball in any frame is delivered, a relay device, means for energizing said relay device when said first and second switch means are closed, first circuit means operable when said relay device is energized to cause said pin-spotter to cycle through a second ball cycle and come to rest preparatory to a second ball cycle, and second circuit means operable when said relay device is energized to prevent said master circuit from detecting and registering pinfall during the time that the pin-spotter cycles through a second ball cycle and comes to rest preparatory to a first ball cycle.

6. Apparatus for controlling a bowling alley pin-spotter comprising mechanism for detecting the number of standing pins after each ball is delivered in a bowling game, a master circuit for converting the number of standing pins detected by said mechanism into fallen pin count and for totalizing said fallen pin count for each frame, a plurality of player score totalizing and storage units, a plurality of switch devices each of which is adapted to connect an associated one of said totalizing and storage units to said master circuit whereby the

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fallen pin count from the master circuit will be applied to a particular player score totalizing and storage unit when the switch device for that unit is closed, first switch means which is closed when said pin-spotter has completed a first ball cycle preparatory to a second ball cycle, second switch means in said master circuit means which is closed when a player prepares to deliver the first ball in any frame and before that player's first ball in a frame is delivered, a relay actuatable when said first and second switch means are closed, first circuit means operable when said relay is actuated to cause said pin-spotter to cycle through a second ball cycle and come to rest pre-

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paratory to a first ball cycle, and second circuit means operable when said relay is actuated to disable said mechanism for detecting the number of standing pins.

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