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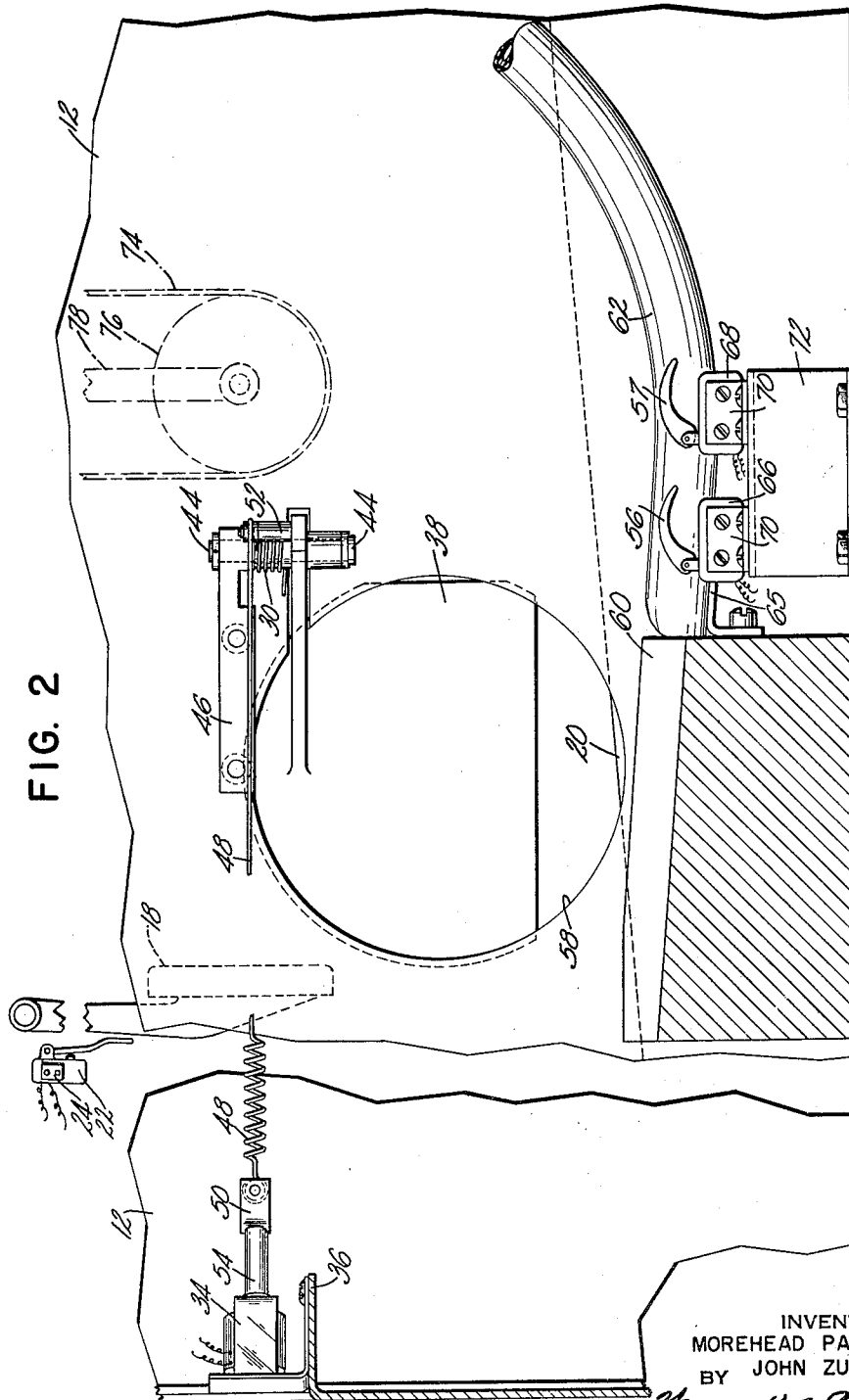
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BALL DELIVERY MECHANISM FOR BOWLING PIN SPOTTING MACHINES

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Original application Jan. 14, 1958, Ser. No. 708,920, now Patent No. 2,969,982, dated Jan. 31, 1961. Divided and this application Mar. 8, 1960, Ser. No. 13,537
9 Claims. (Cl. 273-49)

This invention relates to bowling pin spotting machines and more particularly to improved mechanism for effecting the removal of bowling balls from the pit of a bowling alley and their delivery to apparatus which returns them to a player at the head end of a bowling alley.

In the operation of bowling pin spotting machines, it is desirable that the ball be returned to the waiting bowler with a minimum of elapsed time, providing maximum enjoyment of the game for the bowler and permitting the bowling establishment to be operated at maximum efficiency. The present invention is characterized by the provision of novel ball delivery mechanism which includes an opening in one of the kickbacks and a swingably mounted door normally closing the opening operating in response to a ball moving against the door to effect the opening of the door so that the ball may roll out through the opening and out of the pit. A door which normally closes the opening is swingably mounted on the inside of one of the kickbacks adjacent the opening therein. The door, when actuated, is swung inwardly into the pit and towards the head end of the associated alley, thereby moving any pins which may be located adjacent to it away from the kickback on which the door is mounted, and thus clearing an unobstructed path for a ball in the pit to roll through the opening and out of the pit. Means is also provided to close the doors as soon as possible after a ball leaves the pit in order to prevent any pins from following the ball out of the pit.

This application is a division of our copending application, Serial No. 708,920, filed Jan. 14, 1958, now Patent No. 2,969,982.

It is, therefore, an object of the present invention to provide novel means for effecting the removal of bowling balls from the pit of a bowling alley.

It is a further object of this invention to provide novel ball doors for closing openings in the kickbacks of bowling alleys, and operating means therefor which decreases the amount of elapsed time required for removing balls from the pit of the bowling alley for delivery to ball return apparatus.

It is an added object of the present invention to provide solenoid-actuated ball doors for closing openings in the kickbacks of bowling alleys swingably mounted for movement into the pit of a bowling alley to permit balls only to be removed therefrom.

An added object of this invention is to provide means for moving pins in the pit of a bowling alley out of the path of travel of a ball thereby providing an unobstructed path for a ball to roll out of or be removed out of the pit of a bowling alley.

With these and other objects not specifically mentioned in view, the invention consists in certain combinations and constructions which will be hereinafter fully described and then specifically set forth in the claims hereunto appended.

In the accompanying drawings which form a part of this specification and in which like characters of reference indicate the same or like parts:

FIGURE 1 is a plan view of a preferred embodiment of the invention.

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FIGURE 2 is a side elevation partly in section, taken on line 2-2, FIGURE 1.

FIGURE 3 is a front elevation, partly in section, taken on line 3-3, FIGURE 1.

FIGURE 4 is a suitable control circuit for the invention.

FIGURE 1 illustrates a preferred embodiment of the invention shown installed and operating between adjacent kickbacks 12 and 14 of two conventional side-by-side bowling alleys 16. The invention is preferably employed with automatic bowling pin spotting machines but can also be used with alleys having other pin spotting means.

It will be understood that when a ball 10 is propelled with sufficient force by a player its momentum will carry it directly into contact with cushion 18 before ball 10, riding on conveyor 20, is carried thereon toward the rear of its respective pit P1 or P2 in the direction of arrow A until it contacts cushion 18. A slowly rolled ball will drop into its respective pit P1 or P2 and be carried by conveyor 20 against cushion 18.

Each pit P1 and P2 of alleys 16 is provided with a transverse pit cushion 18 swingably mounted in suitable framework (not shown) (see FIGURE 1). The upper lap of each conveyor 20 is supported by a platform 21 suitably secured adjacent the lower edges of side plates 12 and 14 to prevent the upper lap of conveyor 20 from sagging under load.

Upon contact with ball 10, cushion 18 swings rearwardly to engage and actuate its respective switch 22 which is suitably secured adjacent the rear of each cushion 18 to kickback 12 or 14 by bracket 24. When switch 22 is thus actuated, a circuit is completed energizing relay 26 (FIGURE 4) which, in turn, closes its contacts 28 and 32. Contact 32, when closed, completes a circuit energizing its associated solenoid 34 which is suitably secured by bracket 36 to kickback 12 or 14 respectively. Contacts 28, when closed, complete a holding circuit through normally closed switch 66 (68) which operates to continue to hold in the circuit through relay 26 after switch 22 is deactuated.

Each kickback 12 and 14 is provided with an opening 58 through which a ball 10 in either pit P1 or P2 can pass to the ball return apparatus (partially shown). A door or gate 38 is mounted adjacent to and normally closes each opening 58. As shown herein doors 38 may be flat so that they substantially are seated within the kickback 12 and 14 or lie flush with kickback covering 40 as shown in FIGURE 1.

Since the construction and operating mechanism of each door or gate 38 is the same, a detailed description of one only is necessary for an understanding of the invention. Similarly FIGURE 4 discloses a suitable circuit for effecting the proper operation of one of the solenoids 34, it being understood that the circuit for operating the other solenoid 34 is the same, although one of the circuits is provided with a control switch 66 and the other a control switch 68 which are actuated by their respective operating arms 56 and 57.

Door 38 is pivotally mounted on shaft 44 secured to its respective kickback 12 or 14 by bracket 46. Spring 30 encircles shaft 44 with one end thereof exerting pressure against its respective kickback 12 or 14 and other end of spring 30 bearing against pin 52 on door 38, thus urging door 38 into closed position in its respective kickback 12 or 14. A second spring 48 is secured at one end to clevis 50, mounted on the external end of armature of solenoid 34. The other end of spring 48 is secured to pin 52.

When solenoid 34 is energized, as described hereinabove, its armature 54 is retracted moving clevis 50 into the position indicated in phantom in FIGURE 1. The

tension force thus induced in spring 48 overcomes the closing force of spring 30, pivoting door 38 about shaft 44 into open position indicated by the dotted lines in FIGURE 1.

With door 38 in open position, the ball 10, which actuated switch 22, can pass through its associated opening 58 in kickback 12 or 14. The rotation and inclined mounting of conveyor 20 in pits P1 and P2 (FIGURE 3) together with the angle at which cushion 18 is installed in pits P1 and P2 (FIGURE 1) effect the movement of ball 10 through opening 58. A rolling ball 10, passing through an opening 58, is deposited on chute 60 which is sloped inwardly towards its center and downwardly away from solenoids 34 and suitably secured to kickbacks 12 and 14. Ball 10 subsequent to its delivery onto chute 60, rolls forwardly on return rails 62, which are preferably constructed of a resilient material such as rubber covering metal tubes 64 secured to suitable support frame work (not shown) by brackets 65. It will be readily apparent that rails 62 may be of solid construction also without affecting their manner of operation.

As ball 10 rolls along rails 62, it depresses the operating arms 56 and 57, thus opening their normally closed switches 66 and 68. Switches 66 and 68 associated with their respective solenoids 34, are secured to bracket 72 by support 70. Bracket 72, in turn, is mounted on suitable frame (not shown). Ball 10, upon further travel along rails 62 is engaged by an endless elevating belt 74, which passes around pulleys 76 (only one shown) mounted in arms 78 (only one shown) and driven in any suitable manner. Belt 74 operates to elevate ball 10 to a return track (not shown) for eventual return to the player at the head end of the associated alley. Rails 62, belt 74 and their associated operating mechanism may be similar in construction and operation to that disclosed in the Zuercher et al. Patent 2,765,172 for Bowling Ball Handling and Return Mechanism. Since this structure forms no specific part of the invention, further disclosure thereof is omitted in the interests of brevity.

As soon as switch 66 or 68 is opened by a ball 10 delivered from either pit P1 or P2, as described hereinabove, the associated holding circuit through contacts 28 of relay 26 is broken, causing the relay 26, corresponding to a particular circuit to be de-energized opening its contacts 28 and 32. When contacts 32 are thus opened, the respective solenoid 34 is de-energized and its respective spring 48 urges armature 54 into its extended position. This enables spring 30 to return its respective door 38 to closed position in its opening 58, thereby preventing any pins from leaving the associated pit P1 or P2 therethrough.

If a ball 10 from pit P1 reaches chute 60 after a second ball in pit P2 has caused its associated relay 26 to be energized, the first ball 10 from pit P1 opening switches 66 and 68 as described above will not interrupt the circuit energizing solenoid 34 of pit P2 since the second ball 10 in pit P2 is still contacting cushion 18 closing its associated switch 22. Switch 22 of Pit P2 completes the circuit energizing its solenoid 34 until switch 68 is again closed when ball 10 from pit P1 is no longer in contact with its operating arm 57 having been engaged by belt 74.

As will be noted best from FIGURE 3, conveyor 20 of pit P2 is at a slightly higher elevation than conveyor 20 of pit P1. If a ball 10 from P1 and a ball 10 from P2 arrive on chute 60 at the same time, the ball 10 from pit P1 being at a lower elevation will tend to urge the ball 10 from pit P2 away from rails 62 and belt 74. This ensures that in the event of simultaneous arrival of balls from both pits P1 and P2, no bottleneck will develop in chute 60 since, in this situation, due to the difference in elevations, the ball 10 from pit P1 will always have preference and proceed first along rails 62 for engagement by belt 74 and return to the head end of the associated alleys.

As described in detail hereinabove, doors 38 are swung into pits P1 and P2. It will be apparent that, since the clearance between the bottom of gates 38 and conveyors 20 is less than the maximum pin diameter, this prevents any bowling pins removed from the playing surface of alley 16 onto conveyor 20 from leaving pit P1 or P2 via opening 58. A ball, due to its spherical shape and contact with cushion 18 and conveyor 20, is propelled sideways as described above. However, a bowling pin due to its particular shape and characteristics is conveyed rearwardly on conveyor 20 and will pass under cushion 18. This eliminates the possibility of a bowling pin leaving pit P1 or P2 via their respective openings 58 when either door 38 is in open position since such a pin would have to move sideways around door 38. Furthermore, should there be a collection of pins on conveyor 20 adjacent the pit side of ball door 38 when a ball causes solenoid 34 to be energized as described above, spring 48 will exert a force through ball door 38 on such a collection of pins. Such force effects the breaking up of the collection of pins, directing them away from the kickbacks 12, 14 and toward the rear of pit P.

What we claim is:

1. Bowling ball handling and return apparatus for use with a bowling alley having a pit at one end, and a kickback adjacent one side of said pit provided with a ball opening through which a bowling ball may roll out of said pit comprising a gate, means mounting said gate for movement from a position closing said opening outwardly into said pit into an open position in which said opening is not closed and a ball may pass through it, said gate being so mounted that the clearance between said gate and said pit is less than the largest pin diameter for a substantial portion of the outward movement of said gate into said pit, means normally tending to urge said gate into closed position relative to said opening, means operative in response to the arrival of a bowling ball at a predetermined location in said pit to move said gate out of said closing position into said pit for passage of said ball out of said pit and through said opening and means for delivering said ball onto a return runway.

2. Bowling ball handling and return apparatus for use with a bowling alley having a pit at one end and spaced kickbacks adjacent opposite sides of said pit, one of said kickbacks being provided with a ball opening through which a bowling ball may move out of said pit, a gate, means mounting said gate for movement out of closing position in said opening outwardly into said pit into an open position in which said opening is not closed and a ball may pass through it, said gate being so mounted that the clearance between said gate and said pit is less than the largest pin diameter for a substantial portion of the outward movement of said gate into said pit, means normally tending to urge said gate into closed position, means operative in response to the arrival of a bowling ball at a predetermined position in said pit to move said gate into said pit for passage of said ball out of said pit and through said opening and means for delivering said ball onto a return runway.

3. The invention as defined in claim 2 wherein said means to move said gate includes an operating circuit, a solenoid connected in said circuit, means connecting said solenoid to said gate, a switch in said circuit mounted adjacent the pit cushion of said alley such that when said ball in said pit is engaged by said cushion, said switch is actuated by said cushion, energizing said solenoid whereby said gate is moved into said pit for passage of said ball out of said pit and means for de-energizing said solenoid to release said open gate after said ball has passed out of said pit.

4. Bowling ball handling and return mechanism for use with two adjacent bowling alleys, each of said alleys having a pit at one end thereof, and spaced kickbacks positioned at opposite sides of each of said pits, the adjacent kickbacks of said alleys each provided with a ball

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opening through which a bowling ball may be rolled out of either of said pits, a gate for each of said openings, means mounting each of said gates for movement from closed position in said opening outwardly into said pit into an open position in which said opening is not closed and a ball may pass through it, each said gate being so mounted that the clearance between said gate and said pit is less than the largest pin diameter for a substantial portion of the outward movement of said gate into said pit, means normally urging each of said gates into said closed position, means operative in response to the arrival of a bowling ball in either of said pits to move the associated gate from closed position into said pit for passage of said ball out of said pit and through said opening and to provide a barrier against movement of pins through said opening, means for incapacitating said last-named means after said ball has passed out of its associated pit, and means for delivering said ball onto a return runway.

5. Bowling ball handling and return mechanism for use with two adjacent bowling alleys, each of said alleys having a pit at one end thereof and spaced kickbacks positioned at opposite sides of each of said pits, the adjacent kickbacks of said alleys each being provided with a ball opening through which a bowling ball may be rolled out of either of said pits, a gate for each of said openings, means mounting said gates for movement from closed position in said openings outwardly into said pit into an open position in which said opening is not closed and a ball may roll through it, each said gate being so mounted that the clearance between said gate and said pit is less than the largest pin diameter for a substantial portion of the outward movement of said gate into said pit, thereby sweeping pins adjacent said gates away from said openings and preventing obstruction to balls moving through said openings, means normally urging each of said gates into closed position relative to its associated opening, an operating circuit for each of said gates, a solenoid in each of said circuits, means connecting each of said solenoids to its associated gate, a pit cushion in each of said pits, means mounting each of said cushions transversely above each of said pits, a switch in each of said circuits mounted adjacent each of said pit cushions such that when a bowling ball in either of said pits engages its respective pit cushion, said switch associated therewith is actuated thereby, energizing its associated solenoid whereby said gate connected to said energized solenoid is moved into said pit so that a ball in said pit may move in front of said gate through said opening out of said associated pit.

6. Bowling ball release apparatus for use with the ball return mechanism of an automatic bowling pin-spotting machine comprising a kickback adjacent one side of the pit of a bowling alley associated with said machine, said kickback provided with a ball opening through which a bowling ball may be rolled out of said pit, a gate, means mounting said gate for movement from a position closing said opening outwardly into said pit into an open position in which said opening is not closed and a ball may pass through it, said gate being so mounted that the clearance between said gate and said pit is less than the largest pin diameter for a substantial portion of the outward movement of said gate into said pit, and

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means for moving said gate out of said opening and into said pit in response to the arrival of a ball in said pit whereby said gate pushes pins in said pit away from said opening and said ball may pass unobstructedly through said opening and out of said pit.

7. Bowling ball release apparatus for use with the common ball return mechanism of two adjacent bowling pin-spotting machines comprising a kickback at the adjacent side of each pit of two side-by-side bowling alleys associated with said machines, each kickback provided with a ball opening through which a bowling ball may be rolled out of either of said pits, a gate mounted in each of said openings for movement from a position closing each said opening outwardly into said pit into an open position in which said opening is not closed and a ball may pass through it, each said gate being so mounted that the clearance between said gate and said pit is less than the largest pin diameter for a substantial portion of the outward movement of said gate into said pit, and means for moving each of said gates out of its respective opening and into its associated pit in response to the arrival of a ball in said associated pit to provide a barrier against movement of pins through said opening and whereby said ball may pass through said respective opening and out of said associated pit.

8. The invention as defined in claim 7 wherein said last-named means includes an operating circuit for each of said gates, a solenoid in each of said circuits, means connecting each of said solenoids to its associated gate, a switch in each of said circuits mounted adjacent the pit cushion of each of said alleys such that when a bowling ball in either of said pits is engaged by its respective pit cushion, said switch associated therewith is actuated thereby, energizing its associated solenoid whereby said gate connected to said energized solenoid is moved into open position in its associated pit for passage of said ball out of said associated pit.

9. Bowling ball handling and return apparatus for use with a bowling alley having a pit at one end, and a kickback adjacent one side of said pit provided with a ball opening through which a bowling ball may be rolled out of said pit comprising a gate, a support for said gate secured to the pit side of said kickback and swingably mounting said gate for movement from a closed position relative to said opening outwardly into said pit into an open position in which said opening is not closed and a ball may pass through it, said gate being so mounted that the clearance between said gate and said pit is less than the largest pin diameter for a substantial portion of the outward motion of said gate into said pit, means normally tending to urge said gate into closed position relative to said opening, means operative in response to the arrival of a bowling ball at a predetermined position in said pit to swing said gate into said pit and push pins adjacent said gate away from said opening for passage of said ball out of said pit and through said opening, and means for delivering said ball onto a return runway.

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