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BOWLING BALL HANDLING APPARATUS

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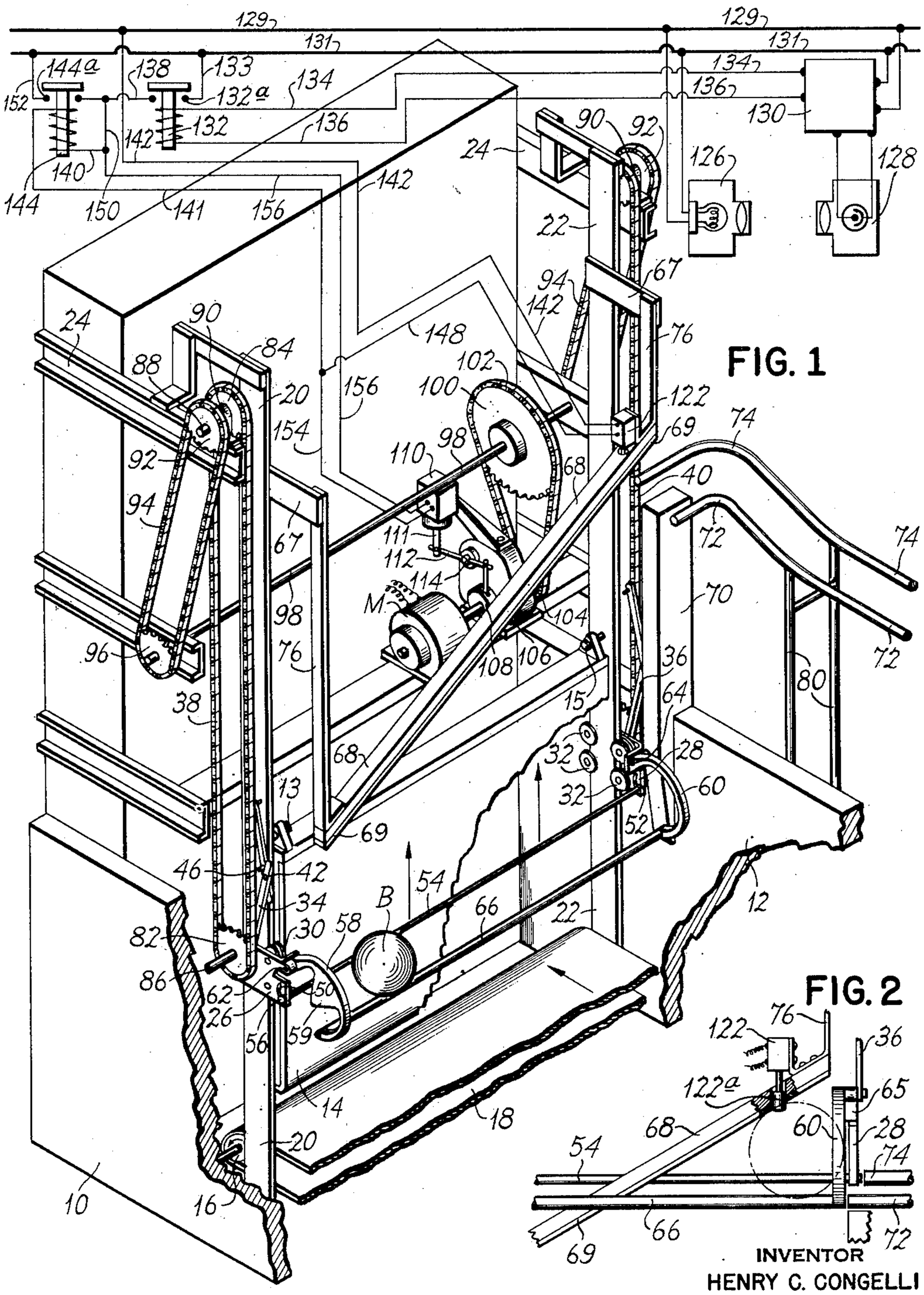

FIG. 1

FIG. 2

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BOWLING BALL HANDLING APPARATUS

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11 Claims. (Cl. 273—49)

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This invention relates to automatic mechanism for performing the functions of a pin boy at a bowling alley and more particularly to apparatus for ejecting a bowling ball from a ball lift which extends along one side of the pit of a bowling alley.

In ball lifts heretofore employed of the type which extend along one side of the bowling alley various devices have been used for causing the ball to move along the length of the lift. For example in some cases the lift has been tilted to cause the ball to roll by gravity towards one end of the lift. In other cases a pusher or a traveling belt has been employed to move a bowling ball along the length of the elongated lift to facilitate its ejection.

These devices employed heretofore have had various disadvantages. In some cases the ejecting mechanism would not succeed in ejecting the ball and in other cases the ejecting mechanism was too complicated to be practicable.

An objective of this invention is to provide a ball ejector which will be of simple and durable construction and which can be relied upon to always eject the bowling ball.

Another object of this invention is to accelerate the bowling ball as it is in the process of being lifted to impart momentum to the ball to hasten its return to the player.

Other objects and features of the invention will appear as the description of the particular physical embodiment selected to illustrate the invention progresses. In the accompanying drawings, which form a part of this specification, like characters of reference have been applied to corresponding parts throughout the several views which make up the drawings.

Fig. 1 is an isometric front elevation illustrating the ball ejector in conjunction with an elongated ball elevating mechanism.

Fig. 2 is a partial front elevation showing the manner in which the ball ejector coacts with the elongated ball lift to discharge a bowling ball.

This invention is particularly well suited for use with an automatic machine which performs the usual functions of a pin boy in clearing an alley of all pins, setting new sets of pins on a bowling alley and removing fallen pins from the bowling alley. If desired reference may be made to U. S. Patent 2,346,189 granted April 11, 1944, to G. J. Schmidt showing one type of automatic pin setting machine to which I refer. In this connection my invention may be readily employed with elongated ball lifts using one or

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more ball lifting bars such as those shown in copending applications of James J. McGinley, S. N. 746,918, filed May 9, 1947, Morehead Patterson, S. N. 1,186, filed January 8, 1948, now Patent No. 2,590,644, and John M. Ernst, S. N. 32,080, filed June 10, 1948.

The elongated ball elevating mechanism with which my invention is employed may be mounted along any side of the pit of a bowling alley. In the apparatus used to illustrate my invention, the ball lifting apparatus is mounted across the back side of the pit of the bowling alley between the kick backs 10 and 12 in a manner similar to that shown in copending application S. N. 32,080. In this location it travels up and down in front of a conventional ball stopping bumper or cushion 14 pivotally suspended from studs 13 and 15. When the roller 16 is driven it causes the carpet 18 to travel in the direction indicated by the arrow to forward the bowling ball and all fallen pins towards the rear of the pit. Suitable means such as a tilting pit or a sweep could also be used in lieu of the carpet 18 to forward bowling balls and pins to the rear of the pit.

Ball cushion 14 is swingingly supported on suitable studs 13 and 15 mounted on the upright rails 20 and 22 respectively. The bottom of the ball cushion 14 is spaced from the carpet 18 a distance less than the diameter of a bowling ball and greater than the widest diameter of a bowling pin to permit bowling pins to pass under the cushion but to maintain the bowling ball in front of the cushion 14. On either side of the continuously traveling carpet 18 are mounted two upright rails 20 and 22 which are supported at their upper ends by skeleton framework 24 of an automatic pin setting machine and at their lower ends by the kick back walls 10 and 12. On each upright rail 20 and 22 is mounted a carriage 26 and 28 which have rollers 30 and 32 running on said rails.

Yieldable drag links 34 and 36 are pivotally connected to their respective carriage 26 and 28 at one end and are pivotally connected at their other end to the sprocket chain 38 and 40 respectively for raising and lowering the carriage 26 and 28. Each yieldable drag link 34 and 36 has pivots 42 interposed between the ends thereof to allow the ends of said links to move relative to one another when the ball lift engages with ball and the bottom of the pit. Suitable studs 46 are mounted on the flexible drag links 34 and 36 to prevent the pivots 42 and 44 from going on dead center with respect to their pivotal end connections.

Each carriage 26 and 28 has a slotted opening 50 and 52 in which is mounted a roller bar 54. The roller bar 54 is held in said slotted openings 50 and 52 by means of suitable collars 56 mounted on the ends thereof. Curved or arc shaped yokes 58 and 60 having a diameter larger than that of a bowling ball are pivotally connected by means of pivot 62 and 64 to the carriages 26 and 28 respectively. The yoke 58 has a ball stop 59 formed thereon to prevent the ball from rolling out through the yoke 58 when it is being elevated. The opposite ends of the curved yokes 58 and 60 support a ball lifting bar 66. The bar 66 is moved to its lowermost position by the force of gravity and is spaced from roller 54 by means of stops 65 engaging with carriages 26 and 28.

A ball guard 70 is mounted on the kick back 12 to prevent the bowling ball B from rolling out through the yoke 60 before it reaches the highest end of longitudinal ball return runway rails 72 and 74 where the ball is discharged. Rails 72 and 74 are supported by a suitable bracket 80. An inclined elongated ball ejector bar 68 is supported at opposite ends by arms 76 from the brackets 67 which are secured to the rails 20 and 22. A suitable nonfriction plate 69, such as Bakelite, is secured to the underside of the bar so as to take up wear and also to decrease friction between the bowling ball and the plate 69. The bar 68 is supported in such manner that it extends at an inclined position across the path of travel of the ball lift.

The carriages 26 and 28 are raised and lowered by suitable means such as sprocket chains 38 and 40 traveling over pairs of suitably spaced sprockets 82 and 84. Sprockets 82 are freely mounted on studs 86 supported in the kick back walls 10 and 12 while sprockets 84 are fixedly mounted on one end of shafts 88 supported in suitable bearings 90 fixed on the skeleton frame 24. Sprockets 92, are fixedly mounted on the other end of shafts 88 and are driven by sprocket chains 94 from the sprockets 96. Sprockets 96 are fixedly mounted on the ends of a shaft 98 which is driven by sprocket 100. Sprocket 100 is driven by chain 102 from the sprocket 104 of a gear reduction box 106.

Motor M, through a conventional combination clutch and brake 108, imparts driving movement to the mechanism inside of the gear reduction box 106. The motor M may be driven continuously from the main power lines 129 and 131 when the alley on which my invention is employed is in use. Clutch 108 is engaged and disengaged by means of a solenoid 110 through a connecting link 112 pivoting on stud 114 of the gear reduction box 106. Gear reduction box 106 and motor M as well as the solenoid 110 are connected to and supported by the skeleton framework 24 of the automatic pin setting machine.

Various devices may be employed for starting the operation of an automatic pin spotting machine upon the throwing of a bowling ball. For purposes of illustration I have shown this starting mechanism to be a conventional photo electric cell device consisting of a source of light 126 and a photo electric cell 128. The light source 126 and the photo electric cell 128 may be located on opposite sides of the bowling alley in front of the positions on which bowling pins are spotted and when a bowling ball is thrown it interrupts the light beam as the ball travels towards the pins.

This interruption in the light beam of the photo electric cell 128 causes a conventional amplifier 130 to momentarily energize the relay 132 through wires 134 and 136. This momentary energization of relay 132 closes a contact 132*a* which causes current to flow from the power line 131, through wires 133, 138, 150, 140 relay 144, wires 141, 148 through the normally closed switch 122 through wire 142 to the main power line 129 thereby causing the hold in relay 144 to be energized and closes contact 144*a*.

When the hold in relay 144 is energized in this manner electrical current flows from the main line 131 through wires 152, 150, 140 through relay 144, through wires 141, 148, normally closed switch 122, wires 142 to the main power line 129. Current also flows from the main power line 131 through wires 152, 150, 156 solenoid 110, wires 154, 148, switch 122, wire 142 to the main power line 129. This flow of current through solenoid 110 energizes the same and causes the plunger 111 to be pulled in an upward direction thereby, through lever arm 112, effecting the engagement of clutch 108. The engagement of clutch 108 causes sprocket 104 to be driven thereby raising and lowering the grab type ball lift made up of bars 54 and 66. When a bowling ball B is carried upwardly by the bars 54 and 66 of the ball lift it contacts the plate 69 attached to the angularly mounted, elongated ejector bar 68. The contact of the ball with said plate causes the ball to move along the length of the ball ejector plate until it strikes the switch button 122*a*, Fig. 2. When the ball actuates the switch button 122*a* it opens the switch 122 and the circuit energizing the hold in relay 144 will be thus interrupted. This interrupts the flow of current through the wires just mentioned and consequently the solenoid 110 is deenergized causing the clutch 108 to disengage and a brake to be applied thereby causing the ball lift to stop at a position where the bars 54 and 66 are level with rails 72 and 74. It should be understood that a ball detecting switch does not have to be mounted on the elongated cam 69 but could be located over the ball return runway or omitted entirely if no such detector is desired.

The operation of my invention may be briefly described as follows:

After the bowling ball is thrown it travels down the alley and momentarily interrupts the light beam between the light source 126 and the photo electric cell 128 before it strikes the bowling pins. The momentum of the bowling ball usually causes it to strike against the ball bumper cushion 14 and drop into the pit. The carpet 18 travels continuously in the direction indicated by the arrow in Fig. 1 and forwards and maintains the ball up against the ball cushion bumper 14, since the diameter of the bowling ball is larger than the distance between the bumper 14 and the carpet 18. Bowling pins on the other hand will be forwarded under the bumper 14 to a suitable pin elevator (not shown) located behind the bumper 14.

As described heretofore, the action of the passing ball upon the electric eye causes the energization of solenoid 110 which in turn effects the engagement of clutch 108. Motor M may run constantly as long as a bowling alley is being used by players. As soon as the clutch 108 is engaged, the sprocket 104 commences to rotate and through sprocket chain 102 drives the main sprocket 100. The rotation of shaft 98, by means of the sprocket 100, causes sprocket 96 mounted on opposite ends of the shaft 98 to rotate. The

rotation of sprockets 96 causes the sprocket 84 to be rotated through sprocket chains 94, sprockets 92 and shafts 88. Sprockets 84 cause the sprocket chains 38 and 40 to travel in a continuous path as shown by the arrow in Fig. 1.

By means of the yieldable drag link connections 34 and 36, the carriages 26 and 28 are lowered when the section of the sprocket chains 38 and 40 to which the links 34 and 36 are connected travel downwardly and are raised when said sections of the sprocket chains 38 and 40 travel upwardly. The carriages are confined to a vertical path of travel by means of the guide rails 38 and 40 on which they track.

By suitable mechanism (not shown) the carpet 18 is continuously moved in the direction indicated by the arrow in Fig. 1 so that any ball and pins discharged into the pit will be moved towards the back end of the pit. As previously mentioned the bowling ball is stopped in front of the cushion 14 and therefore when the grab type ball lift is lowered as shown in Fig. 3 the bars 54 and 66 engage with and slide around opposite sides of the bowling ball. In this connection the bar 54 is able to slide up in the slots 50, 52 when striking the ball and the bar 66 in camming around the opposite sides of the ball swings the curved yokes 58 and 60 on their respective pivots 62 and 64.

When the bars 54 and 66 of the grab lift reach their lowermost position as shown in Fig. 4 the yieldable drag links 34 and 36 will be flexed in the manner shown thereby allowing the upper connection of the drag link to move downwardly while the carriages 26 and 28 remain stationary. If desired, suitable shock absorbing stops (not shown) may be employed for fixing the limits to which the carriages 26 and 28 descend.

It will be noted that the center of gravity of the bowling ball B is located above a plane passing through the center of pivots 62 and 64 and the longitudinal axis of roller bar 66. As a consequence the weight of the ball pressing against the roller bar 66 locks the bars 54 and 66 in place and prevents the ball from falling out of the grab type lifting mechanism. In other words the component of force holding the bars 54 and 66 together is greater than the forces pushing said bars 54 and 66 apart.

As the grab type lift is elevated the bowling ball engages with the plate 69, and due to the inclined position of the plate 69, the ball is cammed towards the discharge end of the ball lift.

To prevent the bowling ball from being discharged through the curved yoke 60 prior to the bars 54 and 66 reaching their uppermost limit of travel a stationary guard 70 is positioned in front of the curved yoke 60.

As the ball is moved along the elongated ball lifting bars 54 and 66, it contacts the switch button 122*a* thus opening the switch 122. When the normally closed switch 122 is opened in this manner by a bowling ball engaging with the switch button 122*a* it interrupts the flow of current through wires 148 and 142. As a consequence the current is interrupted and the relay 144 is deenergized. The current flowing through the solenoid 110 is similarly interrupted causing the armature plunger 111 to be released and thereby disengages the clutch 108 through the clutch actuating arm 112.

In the event that a bowling ball is not picked up by the bars 54 and 66 on their first descent the carriages 26 and 28 would nevertheless be elevated but upon reaching their upper limit of travel the switch button 122*a* would not be depressed. Therefore the switch 122 would not be opened and the hold-in relay 144 and the solenoid 110 would not be deenergized. As a consequence sprocket chains 38 and 40 continue traveling and the carriages 26 and 28 are lowered a second time. The ball lift continues recycling in this manner until it succeeds in picking up a ball. If desired suitable mechanism such as a stepper switch may be employed to allow the ball lift to recycle a predetermined number of times and then stopping the lift in its uppermost position.

If the ball should be closely adjacent to the discharge end of ball lifting bars 54 and 66 it would be ejected onto the ball return runway rails 72 and 74 by the ball ejector plate 69 because the inclined bar 68 is positioned low enough and gives the ball enough momentum so that the bowling ball moves laterally with respect thereto before the bars 54 and 66 reach their uppermost limit of travel. This arrangement provides a positive device for ejecting a bowling ball along the entire length of the ball lift.

It will thus be seen that I have provided a bowling ball ejecting device which is simple and rugged in construction and which is capable of accelerating a ball along the entire length of an elongated ball lift so as to hasten its return to a bowling player.

The invention above described may be varied in construction within the scope of the claims for the particular device selected to illustrate the invention is but one of many possible embodiments of the same. The invention, therefore, is not to be restricted to the precise details of the structure shown and described.

What is claimed is:

1. Automatic bowling ball handling mechanism comprising, an elongated bar for engaging and elevating a bowling ball from the pit of a bowling alley, an inclined stationary member positioned across the path of travel of a bowling ball elevated by said bar adjacent the path of travel of said bar to cause said bowling ball to be pushed along the length of said elongated bar when said bowling ball is brought into engagement with said member, said member being inclined with respect to said elongated bar, and means for raising and lowering said elongated bar.

2. Apparatus for use with an automatic ball and pin handling machine comprising, an elongated elevating bar mounted along one side of the pit of a bowling alley, apparatus for raising said bar to elevate a bowling ball from the bottom of the pit to a ball discharge station, an elongated stationary ball ejecting bar mounted at an angle inclined with respect to the ball elevating bar and positioned in the path of movement of a bowling ball being elevated by said ball elevating bar, and apparatus for raising said ball elevating bar to bring a bowling ball into contact with said inclined stationary bar to cause said bowling ball to move along and be ejected from said elevating bar at said discharge station.

3. Automatic bowling ball handling apparatus comprising, an elongated bowling ball lift positioned along one side of the pit of a bowling alley, an inclined stationary bar positioned to extend along the length of said elongated ball lift at an inclined angle thereto and in the path of travel of a bowling ball being elevated thereby, a ball return runway and mechanism for raising said ball lift to bring the bowling ball into contact with

said inclined stationary bar to cause the ball to be moved along and ejected from the ball lift at a predetermined elevation, said lift having a track along which said ball can roll and an opening which clears the inclined bar when the lift is raised and lowered past said inclined bar.

4. Automatic bowling ball handling apparatus comprising, a pair of spaced elongated ball elevating bars mounted for movement between the pit of a bowling alley and a ball return runway, an inclined stationary bar positioned to extend along and in between the paths of travel of said spaced elongated ball elevating bars and be inclined in the direction of the ball return runway with respect to said ball elevating bars, and mechanism for moving said ball elevating bars from the pit of a bowling alley to said ball return runway to bring a bowling ball elevated by said ball elevating bars into contact with said inclined stationary bar to cause the ball to be moved along the length of said ball elevating bars for discharge onto said ball return runway.

5. Automatic bowling ball handling apparatus comprising, a frame, a stationary elongated bar extending at an inclined angle with respect to an elongated ball elevator, from said frame over and along one side of the pit of a bowling alley, an elongated ball elevator constructed and arranged for the sides thereof to straddle said stationary inclined bar when moved to its uppermost position, and mechanism for moving said elongated elevator between the pit of a bowling alley and a ball return runway to cause a bowling ball elevated by said elevator to be brought into contact with said stationary elongated bar to cause the bowling ball to be ejected thereby from said elevator.

6. Automatic bowling ball handling apparatus comprising, a ball elevator consisting of at least one moving elongated ball elevating bar, a stationary inclined bar positioned at an incline with respect to said ball elevating bar to move a ball being elevated by said bar along the length thereof, friction reducing material mounted on the underside of said stationary inclined bar, and mechanism for raising said ball elevator to bring a bowling ball into contact with the friction reducing material mounted on said stationary inclined bar to move and eject a bowling ball lengthwise of said elevator to accelerate its return to a bowling player.

7. Apparatus for removing a bowling ball from the pit of a bowling alley comprising, a device for moving a bowling ball to one side of the pit of a bowling alley, a ball elevator extending along one side of the pit of a bowling alley and traveling between said side of the pit of a bowling alley and a ball return runway, a stationary inclined member positioned along the length of said ball elevator and at an incline thereto and in the path of travel of a bowling ball being elevated by said elevator to move a bowling ball along the length thereof, a ball return running along the length of a bowling alley, and mechanism for moving said elevator from the bottom of the pit upwardly to an elevation level with said ball return to bring

a bowling ball carried by said elevator into contact with said inclined member to cause the ball to be ejected by said inclined member from said ball elevator onto said ball return.

8. Apparatus of the type provided for in claim 7 wherein a switch is positioned adjacent the upper end of said inclined member for actuation by an elevated bowling ball to stop the movement of said ball elevator when a bowling ball has been elevated thereby.

9. Bowling ball handling apparatus comprising, a device for moving a bowling ball to one side of the pit of a bowling alley, a ball elevator having at least one elongated bar extending along said side of the pit, a ball return runway, mechanism for continuously moving said ball elevator between said side of said pit and said ball return runway, a detector for starting said mechanism in operation when a thrown bowling ball has been detected, an inclined member having an elongated ball contacting surface associated with and extending along the length of said ball elevator for ejecting a bowling ball elevated by said elevator at one end of said inclined member, and a switch positioned at the ejecting end of said inclined member for stopping said ball elevator from operating after a bowling ball has been elevated thereby.

10. Bowling ball handling apparatus comprising a device for moving a bowling ball to one side of the pit of a bowling alley, a ball elevator having at least one elongated ball lifting bar extending along said side of the pit, a ball return runway, mechanism for continuously moving said ball elevator between said side of said pit and said ball return runway, and a stationary cam means arranged to give a bowling ball a movement lengthwise of the ball elevator onto the ball return runway for return to a player.

11. Bowling ball handling apparatus comprising a device for moving a bowling ball to one side of the pit of a bowling alley, a ball elevator having at least one elongated bar extending along said side of the pit, a ball return runway, mechanism for continuously moving said ball elevator between said side of said pit and the ball return runway, and an elongated cam surface extending at an angle along the length of said ball elevator to cam an elevated bowling ball onto said ball return runway.

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