June 18, 1963 H. NEVILLE, JR., ET AL 3,094,328

BOWLING BALL LIFT

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Fig. 1

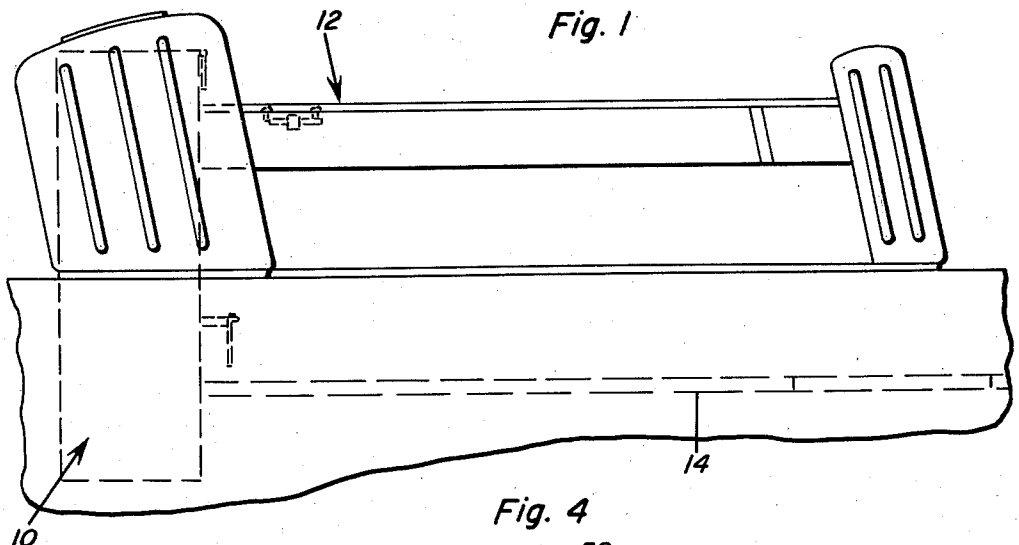

Fig. 4

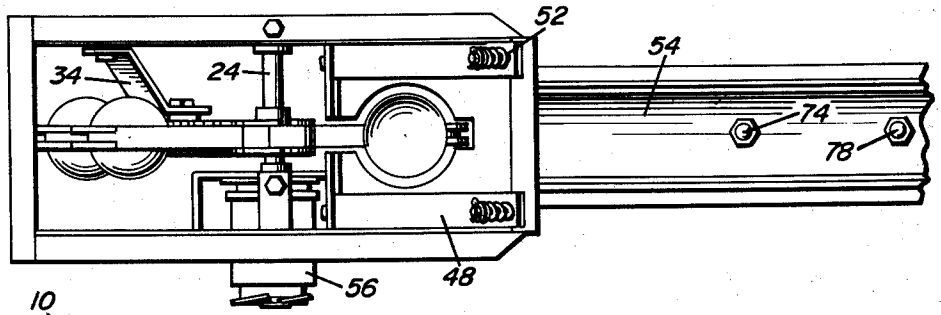

Fig. 5

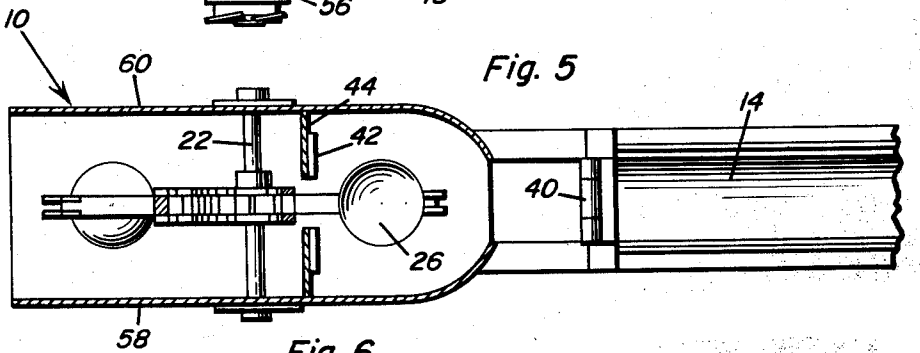

Fig. 6

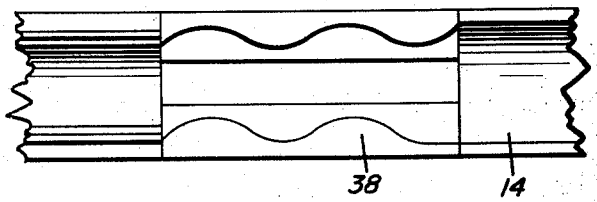

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Fig. 2

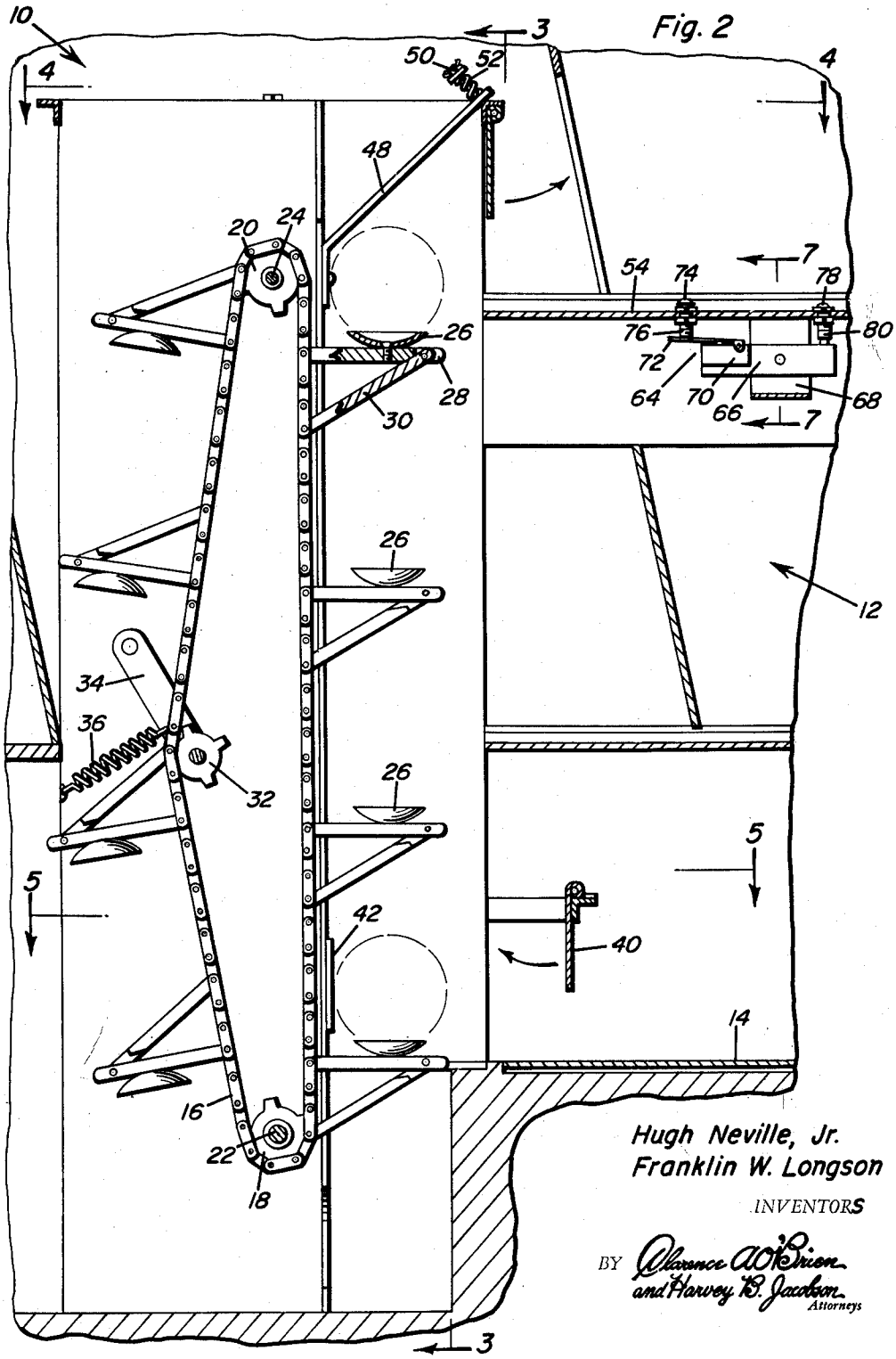

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Fig. 3

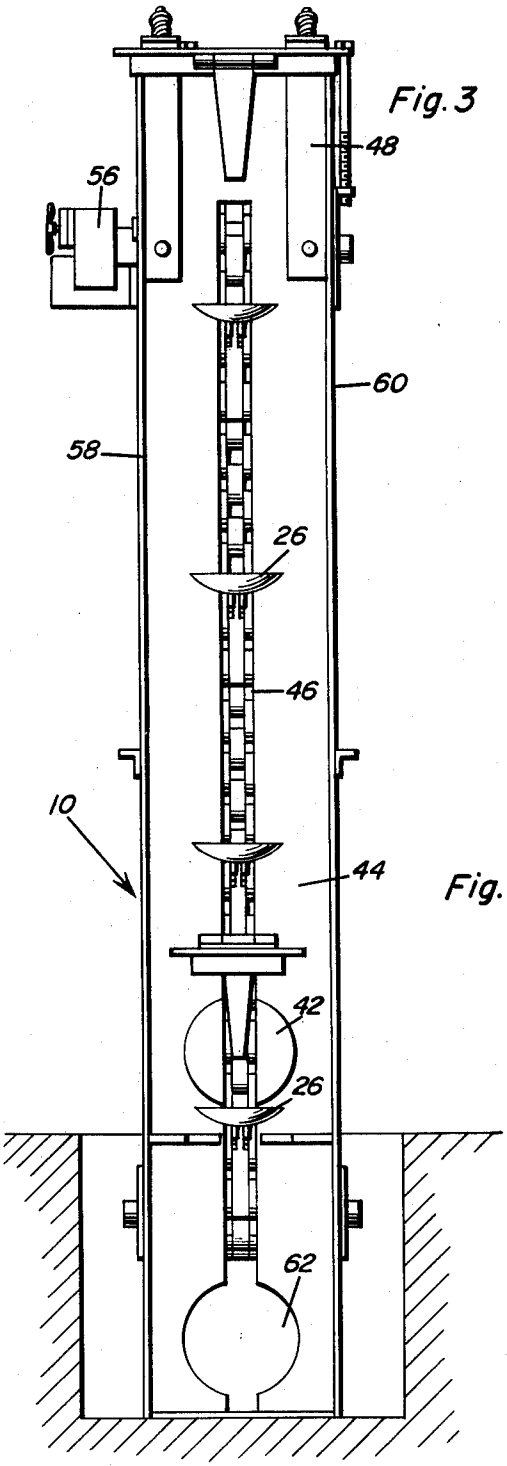


Fig. 7

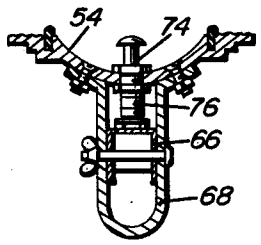


Fig. 8

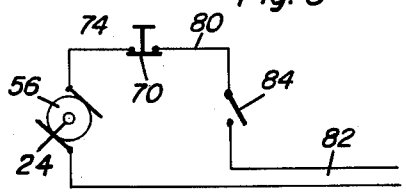
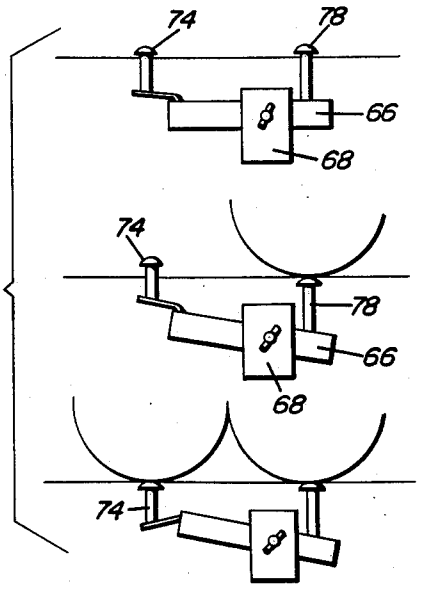


Fig. 9



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BOWLING BALL LIFT

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5 Claims. (Cl. 273—49)

This invention relates to mechanism used for returning bowling balls to a front end bowling ball storing unit as commonly used in conjunction with bowling alleys in recreational establishments.

It is therefore a primary object of this invention to provide a novel return ball lift mechanism to be used in conjunction with a ball return alley disposed beneath the floor, said lift mechanism carrying the returning balls from the return alley upwardly and directing them onto the front end storing unit.

Another object of this invention in accordance with the foregoing object, is to provide a return ball lift mechanism which is much quieter in returning bowling balls to the front end storing unit than is possible with the present conventional returns.

A further object of this invention in accordance with the foregoing objects, is to provide a bowling ball return which clears the space between the foul line and the front end unit, enabling bowlers to have freer movement in bowling.

An additional object of this invention, is to provide a bowling ball return mechanism which eliminates the possible danger to the bowler's hands from balls entering the storing unit at too fast a speed, without the use of slowing devices that often prevent entry of the bowling balls onto the storing unit.

Another object of this invention in accordance with the foregoing objects, is to provide a ball return mechanism which is automatically operative to continuously supply the front end storing unit with returning balls and yet automatically operative to cease operation only when the storing unit is fully loaded with bowling balls.

The novel lift mechanism in accordance with this invention, includes a vertically disposed conveyor which interconnects a ball return alley disposed beneath the floor of the bowling alley, with the storing unit at the front of the bowling alley. The conveyor consists of an endless flexible belt carrying a predetermined number of ball receiving cups or members equal in number to the number of balls capable of being stored on the storing unit, the balls thereby being returned by the return alley, slowed down by a speed regulating device in the return alley and entering the conveyor through a ball check, the conveyor lifting the balls upwardly into alignment with the track on the storing unit and being ejected onto said track by means of sloping ejection bars yieldably engaging the balls and directing them onto the storing unit track, past an outlet ball check. The conveyor is driven by a continuously operating motor while a switch device which is mounted below the storing track on the storing unit automatically disconnects the conveyor driving motor when the storing unit is fully loaded by means of the final ball actuating the switch device, said switch device being automatically operative to reenergize the motor when there is any reduction in the number of balls on the storing unit.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a side elevational view of the front end storing unit with the ball return mechanism shown in dotted outline in installed position relative to the front end storing unit.

FIGURE 2 is a vertical sectional view through the ball return mechanism.

FIGURE 3 is a section view taken through a plane indicated by section line 3—3 in FIGURE 2.

FIGURE 4 is a top view of the ball return mechanism as viewed from a plane indicated by section line 4—4 in FIGURE 2.

FIGURE 5 is a section view taken through a plane indicated by section line 5—5 in FIGURE 2.

FIGURE 6 is a top view of the speed regulating mechanism disposed on the ball return alley.

FIGURE 7 is a section view taken through a plane indicated by section line 7—7 in FIGURE 2, showing the automatic switch mechanism.

FIGURE 8 is a schematic illustration of the control circuit for controlling the drive of the ball return mechanism.

FIGURE 9 schematically illustrates operation of the automatic switch mechanism in three phases thereof.

Referring to the drawing in detail, FIGURE 1 shows the ball lift mechanism generally indicated by reference numeral **10**, as shown by dotted line installed within the front end of a bowling ball storing unit generally indicated by reference numeral **12**, the lift mechanism **10** cooperating with a ball return alley generally indicated by reference numeral **14** and shown in dotted line disposed beneath the alley floor.

As seen in FIGURE 2, the lift mechanism **10** includes a moving endless belt **16** in the form of a sprocket chain which is trained over a pair of sprocket wheels **18** and **20** which are rotatably mounted on fixed axis axles **22** and **24** one of which axles, for example axle **24** is power driven by a prime mover such as an electric motor. The sprocket chain **16** has a plurality of ball receiving cups **26** connected thereto in spaced relation by means of a supporting bracket **28** pivotally connected to one of the chain links and held in rigid position relative to the chain by means of an interconnecting link **30** connecting the outer end of bracket **28** to another of the chain links. The sprocket chain **16** is maintained under proper tension by means of an idler sprocket **32** engaged with the chain and rotatably mounted on an arm **34** to pivotally connect it to the frame of the lift mechanism **10**, said arm **34** being yieldably biased in one direction by means of spring **36** to thereby maintain the chain **16** under proper tension.

As the moving belt **16** brings a cup **26** into alignment with the return alley **14** a ball moving from the rear end of the return alley **14** due to the slight downward slope of the alley **14** toward the front end, will enter and be received within one of the cups **26** on the sprocket chain **16** which is moving very slowly. The ball on the return alley **14** is slowed down to proper speed by means of a speed regulator **38** as seen in FIGURE 6 which is operative in a manner well known in the art to retard the ball by directing it in a wavy path for a short distance. Before entering the inlet portion of the conveyor mechanism **10**, the returning ball will pass by a one-way check consisting of a plate **40** pivotally connected for inward movement to the inlet portion of the conveyor mechanism **10**. Accordingly, a ball when permitted to enter the inlet portion of the conveyor by the spaced brackets **28**, positioned as shown in FIGURE 2, will be cushioned by backing member **42** connected to the rear wall **44** as seen in FIGURE 3 having a centrally disposed slot **46** therein through which the supporting brackets **28** and links **30** extend for support of the ball receiving cups **26**. It will further be apparent from FIGURE 2, that when a lifting cup **26** is not in the position illustrated to receive a ball, the forward end of the cup carrier bracket **28** with which such lifting

cup is associated, will prevent the ball from entering the lift mechanism until the bracket 28 clears the inlet portion by upward movement therefrom, at which time the next bracket and cup spaced therebelow on the conveyor belt 16, will be in position to receive the ball.

As seen in FIGURES 2 and 3, an ejection device is disposed within the outlet portion of the conveyor mechanism 10 and includes a pair of shunt bars 48 which are connected to the wall 44 of the conveyor mechanism and slope forwardly and upwardly therefrom for connection to a bolt 50 connected to the top of the conveyor mechanism the shunting bars 48 being slidable relative thereto against the bias of a spring 52 disposed on the bolt 50 for biasing the shunting bars downwardly. It will therefore be obvious, that as a bowling ball is raised to the position by the cup 26 in alignment with the track or runway 54 of the storing unit 12, continued upward movement of the cup 26 will cause the ball to be cammed into engagement with the shunting bars 48 which will thereby push the balls onto the track 54 of the storing unit 12.

From the foregoing description, it will be apparent that the chain 16 on which the ball receiving cups 26 are mounted, must be slowly moving continuously so as to receive the balls from the return alley 14. Accordingly, the sprocket wheel 20 may be continuously driven slowly by means of a motor connected to the axle shaft 24 to which the sprocket wheel is connected, a motor being shown in FIGURE 3 for said purpose generally indicated by reference numeral 56. As will be seen in FIGURES 3, 4 and 5 the axles 22 and 24 are mounted between the side walls 58 and 60 of the conveyor mechanism 10. Accordingly, the sprocket chain 16 is slowly driven through the sprocket wheel 20 so as to carry the balls received within the cups 26 slowly upwardly between the lower inlet portion and upper outlet portion of the conveyor mechanism, said cups moving through openings 62 disposed in the wall 44 at both the lower and upper ends thereof as seen in FIGURE 3.

Automatic control mechanism is provided to stop movement of the conveyor 16 when the storing unit is fully loaded with bowling balls. Accordingly, a switch mechanism for stopping the motor by de-energization thereof, is provided in the storing unit 12. The control mechanism generally indicated by reference numeral 64 is more clearly seen in FIGURE 2, and includes a frame element 66 which is pivotally mounted below the track 54 of the storing unit by means of bracket 68 attached to the underside of the track 54 as more clearly seen in FIGURE 7. Secured to one end of the frame element 66 is a switch device 70 pivotally mounting a switch arm 72 which may be actuated by means of a drive control button 74 slidable within a fitting 76 mounted within and extending through the track 54, with the button 74 extending upwardly into the track 54 so that it may be engaged by a ball within the track 54. The button 74 is accordingly spaced from the outward end of the conveyor mechanism such a distance that the last ball capable of being stored on the storing unit track 54 will actuate the button or depress the button 74, as will be evident from FIGURE 4. A similar storage condition detecting button 78 is disposed within the track 54 and spaced rearwardly of the button 74 a distance equal to the spacing between the bowling balls stored on the storing unit, said button 78 being slidably disposed within a fitting 80 similar to fitting 76, said button 78 being connected to the other end of the frame element 66.

Attention is invited toward FIGURE 9, in order to explain operation of the control mechanism 64. As seen in the top phase of the FIGURE 9 diagram, neither of the actuating buttons 74 nor 78 are engaged by any of the bowling balls, since the storing unit is not fully loaded. The intermediate phase diagram of FIGURE 9 shows the storage detecting button 78 being actuated by a non-displaceable bowling ball which represents the next to the final ball capable of being stored on the storing unit 12 under loaded storage conditions. As will be seen from the intermediate phase diagram, the switch actuating button 74 has been operatively conditioned since the frame 66 on which the switch device is mounted is rigidly positioned between the actuated button 78 and the pivotal mounting of the supporting bracket 68. Therefore, in the lower phase diagram of FIGURE 9, the final bowling ball actuates the switch actuating button 74. It should be realized therefore, that unless the button 78 is maintained depressed by a bowling ball, the switch actuating button 74 will not be operative to actuate the switch device 70 since depression of the button 74 will only cause the pivoted frame element 66 to pivot about its supporting bracket 68. It is therefore apparent, that the switch device 70 will only be actuated by a ball when the storing unit is fully loaded.

As seen in FIGURE 8, a circuit diagram illustrates by example only how the switch device 70 when actuated will deenergize the motor 56 to thereby stop movement of the conveyor chain 16.

FIGURE 8 illustrates by example only a control circuit which may be opened by actuation of the switch device 70 to deenergize the electric motor 56 to thereby stop movement of the conveyor sprocket chain 16 when the storing unit 12 is fully loaded. FIGURE 8 accordingly illustrates a circuit wiring 80 which is connected to the terminals of motor 56 and which includes means 82 for connecting the circuit to a source of electrical power with the circuit being closed for continuous operation by means of a manually actuated control switch 84 with the switch device 70 being normally closed as illustrated. When the switch device 70 is actuated by means of switch actuating button 74 as hereinabove explained, the switch device will open the circuit to thereby de-energize the motor 56.

From the foregoing description, operation of the bowling ball return mechanism will be apparent. It will therefore be appreciated that the return mechanism in accordance with this invention, will eliminate the return alleys normally visible in present bowling alley establishments and also eliminate the noise from the returning balls because of the disposition of the return alley underneath the floor. Also, by virtue of the return mechanism in accordance with this invention, there is no danger to the bowler's hands from balls entering the storing unit at too great a speed.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A bowling ball return mechanism connected to a subsurface ball return alley, comprising ball conveying means disposed between the return alley and a front end ball storing unit, ejection means operatively connected to said conveying means for directing balls from an upper end of the conveying means onto said storing unit, and control means operatively connected to said storing unit and conveying means and responsive to the storing of a predetermined number of balls on said storing unit for deenergizing said conveying means and reenergizing conveying means in response to a reduction in said predetermined number of balls, said control means including continuously operating power drive means for said conveying means and power stop control mechanism conditioned for operation by the storing of one ball less than said predetermined number and actuated by the storing of said predetermined number of balls to stop said power drive means, said control mechanism including a switch device secured to one end of a frame pivotally mounted on said storing unit, a switch actuating button connected to said switch device and extending upwardly for engagement by a ball on the storing unit and spaced from said ejection means a distance substantially equal to a ball diameter.

and a switch conditioning button connected to another end of said frame and spaced from said switch actuating button a distance equal to the spacing between balls stored on the storing unit.

2. A bowling ball return mechanism in combination with an enclosed sub-surface ball return alley and a front end ball storing unit, comprising, vertically moving ball conveying means having a lower end in alignment with the return alley and an upper end in alignment with the storing unit directly above the return alley, ball ejection means mounted at the upper end of the conveying means operative to deflect balls into the storing unit in response to movement thereof by the conveying means, and a control mechanism operatively connected to the storing unit and conveying means for intermittently disabling the conveying means when the storing unit stores a predetermined number of bowling balls, said control mechanism including a switch device secured to one end of a frame pivotally mounted on said storing unit, a switch actuating button connected to said switch device and extending upwardly for engagement by a ball on the storing unit and spaced from said ejection means a distance substantially equal to a ball diameter, and a switch conditioning button connected to another end of said frame and spaced from said switch actuating button a distance equal to the spacing between balls stored on the storing unit.

3. The combination of claim 1, wherein said conveying means includes a vertically disposed and moving endless belt having a plurality of ball receiving lift members connected thereto, said belt vertically moving said members between an inlet portion of the conveying means in alignment with said return alley and an outlet portion in alignment with said storing unit.

4. The combination of claim 1, further including one-way ball check means operatively connected to the conveying means at its inlet and outlet portions.

5. In combination with a powered ball conveyor continuously delivering bowling balls to a ball storing unit, control mechanism for discontinuing delivery of balls by the conveyor in response to a loaded condition of the storing unit comprising, a switch device secured to one end of a frame pivotally mounted on said storing unit, a switch actuating button connected to said switch device and extending upwardly for engagement by a ball on the storing unit and spaced from said conveyor a distance substantially equal to a ball diameter, and a switch conditioning button connected to another end of said frame and spaced from said switch actuating button a distance equal to the spacing between balls stored on the storing unit.

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