April 11, 1967 M. E. UNTIEDT 3,313,540

VARIABLE SPEED BALL LIFT

Filed Aug. 12, 1963

Fig. 1.

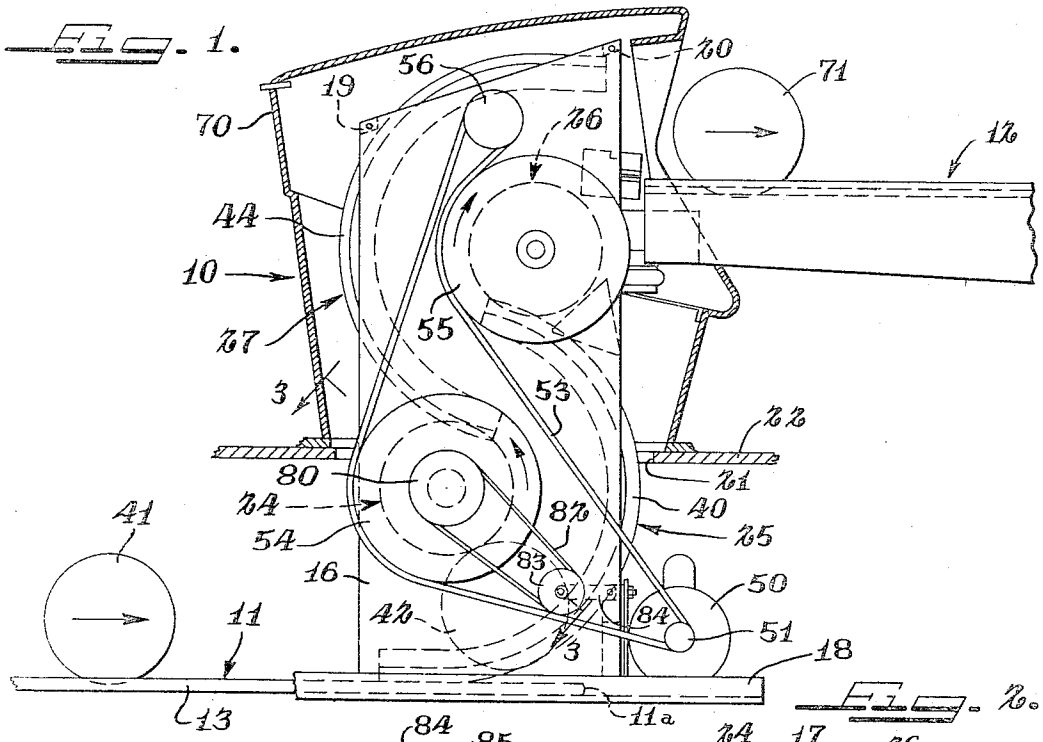


Fig. 2.

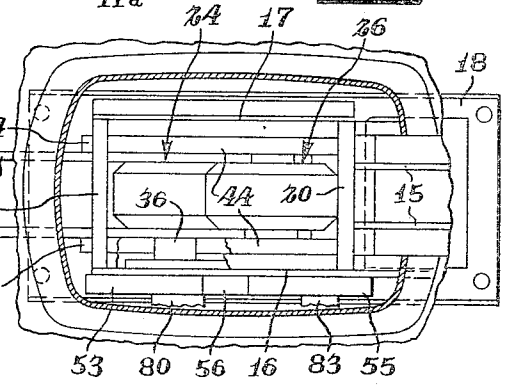


Fig. 3.

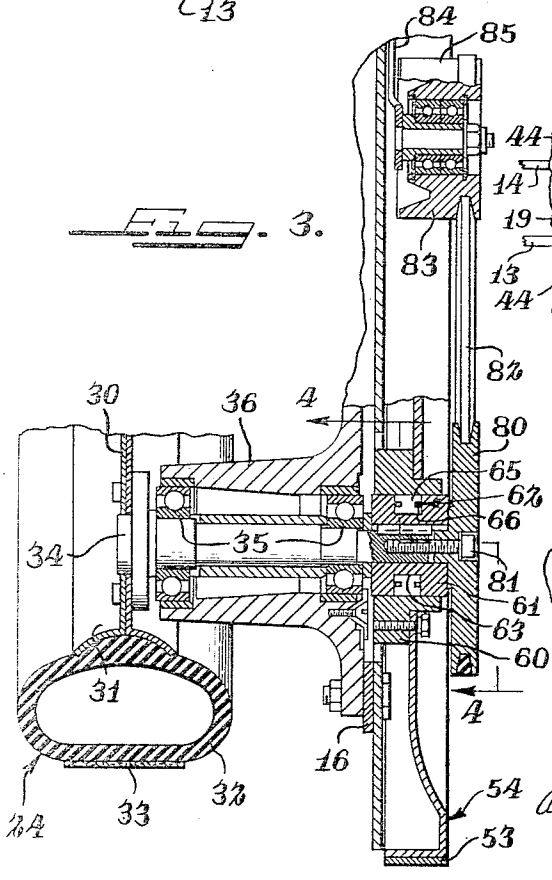
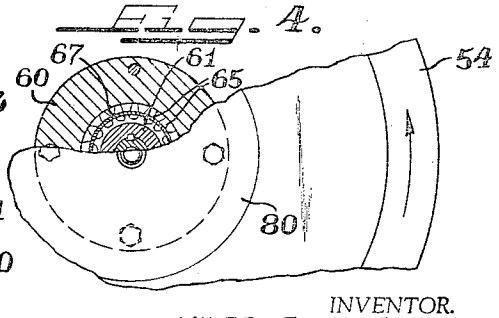


Fig. 4.



INVENTOR.
MILES E. UNTIEDT

BY Hofgren, Wegner, Allen, Stellman & McCord
Attys.

United States Patent Office 3,313,540 Patented Apr. 11, 1967

3,313,540

VARIABLE SPEED BALL LIFT

Miles E. Untiedt, Muskegon, Mich., assignor to Brunswick Corporation, a corporation of Delaware

Filed Aug. 12, 1963, Ser. No. 301,398
9 Claims. (Cl. 273—49)

This invention relates to a bowling ball lift mechanism, and more particularly to a ball lift mechanism located at the player's end of a bowling alley.

An object of this invention is to provide a new and improved ball lift.

Another object of this invention is to provide a new and improved ball lift which receives a ball traveling at any speed along a ball return track disposed beneath the level of the alley without stoppage or slowing down of the ball prior to entry into the lift, and discharges the ball therefrom onto a storage rack at a controlled low speed whereby the momentum of a ball traveling along the return track is taken up by the ball lift mechanism without ball marking and the ball is discharged at a controlled drop-off rate onto the storage rack.

A further object is to provide a new and improved ball lift mechanism including a ball elevating wheel and track for receiving a fast moving ball, means for driving the wheel including an overrunning clutch to allow the wheel to speed up when engaged by a ball moving at a rate greater than the wheel, and overdrive means to rotate the wheel initially at the speed of the entering ball.

Further objects and advantages will become apparent from the following detailed description taken in connection with the accompanying drawings in which:

FIG. 1 is a vertical sectional view illustrating the ball lift mechanism of the present invention;

FIG. 2 is a top plan view of the mechanism illustarted in FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view taken at about the line 3—3 of FIG. 1; and

FIG. 4 is a fragmentary view, partly in section, taken on the line 4—4 of FIG. 3.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail a preferred embodiment of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

Referring now to the drawing, a power lift mechanism generally designated 10 is interposed between a ball return track as at 11 and a ball storage rack as at 12, for elevating balls from the track to the rack. The track 11 may comprise a pair of rod-like track members 13 and 14 which extend to terminal positions as at 11*a* beneath the power lift mechanism 10. The ball storage rack 12 includes a pair of track portions as at 15 which enable the balls to roll along the storage rack from the power lift mechanism to storage positions.

The power lift mechanism includes a suitable framework comprising a pair of spaced side plates as at 16 and 17 attached to a suitable support in the form of a plate as at 18, and braced at the upper ends by transverse connecting members as at 19 and 20. The plates 16 and 17 project upwardly through an opening as at 21 in the floor of a bowling alley as at 22.

A first ball handling or conveying mechanism includes a first, lower wheel as at 24 and a cooperating track 25; and a second ball handling or conveying mechanism includes a second, upper wheel as at 26 and a cooperating track as at 27. Each of the wheels 24 and 26 is constructed substantially as illustrated in FIG. 3,

and includes a central plate or web 30 having a rim 31 supporting an inflatable tire 32 having a suitable wear-resistant cover such as leather as at 33. The central web 30 includes a hub 34 fixed thereto and rotatably mounted as by bearings 35 in a housing 36 supported in cantilever fashion on the side plate 16.

The lower track 25 cooperating with the wheel 24 includes a pair of conventionally arranged track members 40 spaced apart a distance less than the diameter of a ball to be rolled thereover, and spaced from the outer periphery of the wheel by an amount somewhat less than the diameter of a bowling ball such as that illustrated in FIG. 1 in full lines at 41 and in broken lines at 42. The lower ends of the track members 40 are adjacent the terminal portion 11*a* of the track 11 and disposed beneath the wheel 24. From this position, the track members 40 are arcuately curved about the axis of rotation of the wheel 24 and extend upwardly to a position adjacent the upper wheel 26.

The track 27 associated with the wheel 26 includes a pair of track members 44 similar to those illustrated at 40, having lower portions terminating beneath the upper ends of the track members 40 for receiving a ball from the latter, and include intermediate portions arcuately curved about the axis of rotation of the wheel 26 and extending to terminal portions overlying the wheel and adjacent to the storage rack 12. While the track members may be generally concentric about the wheels, they are preferably slightly eccentric so that the lower ends are spaced further from the wheel to facilitate ball entry.

In operation, it will be understood that the wheels 24 and 26 are driven by a suitable drive mechanism to rotate in opposite directions indicated by the directional arrows of FIG. 1, the lower wheel 24 rotating in a counterclockwise direction and the upper wheel 26 rotating in a clockwise direction. As the balls are delivered to the power lift mechanism, they engage the lower tracks 40 and the lower wheel 24, the latter being operable to roll the balls up the track members 40, delivering the same to the track members 44 whereupon the wheel 26 is effective to roll the balls upwardly on the last-mentioned track members for delivery to the rack 12. It will be understood that the balls may enter the lift mechanism traveling at a high rate of speed and are delivered from the mechanism to the rack 12 at a controlled rate of speed, traveling in the same direction.

The drive mechanism for both wheels 24 and 26 preferably includes a drive motor as at 50 suitably supported on the frame members 16 and 17 and including a drive pulley 51 having a belt 53 trained thereabout and passing around drive pulleys 54 and 55, and about an idler pulley 56. The pulley 55 is secured directly to the hub of the wheel 26 and is rotatable therewith. The pulley 54 is associated with the lower wheel 24 for rotation therewith and relative thereto.

In order to reduce noise and ball marking when balls enter the lift mechanism traveling at a high rate of speed, the wheel 24 is connected to the pulley 54 through the medium of an overrunning one-way clutch, by means of which the pulley 54 is able to drive the wheel 24, but which enables the wheel 24 to overrun the pulley.

Referring particularly to FIGS. 3 and 4, the pulley 54 is constructed with a hub as at 60 which comprises one clutch member rotatable relative to a second clutch member 61 which is secured to the hub 34 of the wheel 24. Preferably, the one-way clutch 62 is a sprag-type clutch, wherein an annular groove 63 in the clutch member 61 is provided with a series of sprags 65 each provided at the lateral edges thereof with a recess as at 66 for receiving a circular coiled spring as at 67 for retaining the sprags in assembly. This is a conventional form

of clutch, and the sprag members are formed such that when the pulley **54** is rotated in a counterclockwise direction, the individual sprag members roll in a manner to bind the clutch member **60** to the clutch member **61** for rotation together. On the other hand, when the clutch member **61** and the wheel **24** are rotated in a counterclockwise direction relative to the pulley **54**, the former are free to rotate relative to the latter, and this enables the wheel to overrun the pulley if the wheel is driven at a speed greater than the speed of the pulley.

Overdrive means are provided for rotating wheel **24** at approximately the speed of the entering ball, including a pulley **80** fixed to wheel hub **34** as by bolt **81**. An endless belt **82** is trained over pulley **80**, and over another pulley **83** that is rotatably mounted upon a bracket **84**, suitably secured to plate **18**. As is best seen in FIG. 1 and FIG. 3, pulley **83** is positioned adjacent the path of travel of belt **53**, so that belt **53** frictionally engages the periphery of pulley **83**, as at **85**, to drive pulley **83**, belt **82** and wheel **24**. Pulley **80** has a smaller diameter than pulley **54**, and thus wheel **24** will be initially driven at a relatively rapid rate, overrunning pulley **54** and enabling the ball lift mechanism to receive a rapidly moving ball without marking the ball. As the ball advances up track **25**, its speed decreases, and the pulley **54** then drives wheel **24** to deliver the ball to track **27**.

Preferably, that portion of the power lift mechanism projecting above the floor **22** is enclosed by a suitable hood as illustrated at **70** which is supported on the floor **22** and includes an opening at the bottom surrounding the lift mechanism and an opening at the top enabling egress of balls onto the rack **12** as at **71**.

I claim:

1. A ball handling mechanism, comprising, a ball storage rack, a ball return track for returning a ball to an alley approach area and including at least a portion thereof disposed at a level below the level of the storage rack and a ball lift for transferring a ball from said return track portion to said rack including a frame, a wheel rotatable on the frame about a generally horizontally disposed axis and overlying said return track portion, an arcuately curved guide track spaced from the wheel including a ball entrance end adapted to lie adjacent said return track portion, an intermediate part disposed to hold a ball against the wheel, and an exit end for directing a ball in a path leading to said storage rack, drive means for rotating the wheel including an overrunning clutch enabling the wheel to rotate at a greater speed than that at which the wheel is driven by said drive means, and overdrive means connected between said wheel, and said drive means for normally rotating said wheel at said greater speed.

2. A ball lift for receiving a moving bowling ball and elevating said ball comprising, a frame, a first ball conveying mechanism mounted on said frame including a first ring-shaped member rotatable about an axis and a first curved guide track spaced from said member, said guide track having a ball entrance end and an intermediate part to hold a ball against the member, a second ball conveying mechanism on said frame including a second ring-shaped member rotatable about an axis and positioned generally above the first member and a second curved guide track spaced from said second member, said second guide track having an end adjacent said first guide track and a ball discharge end with an intermediate part to hold the ball against the second member, means for rotating both members including an overrunning clutch permitting the first member to rotate at a speed greater than the speed at which the first member is driven by said rotating means, and overdrive means connected between said rotating means and said first wheel for normally driving said first member at said greater speed.

3. A ball handling mechanism comprising, a ball storage rack, a ball return track for returning a ball to an alley approach area, means for transferring a ball from said track to said rack including a ball return ball lift comprising, a frame, a first ball conveying mechanism mounted on said frame including a first wheel rotatable about an axis and overlying the return track and a first arcuately curved guide track spaced from said wheel, said guide track having a ball entrance end adapted to lie adjacent the return track and an intermediate part to hold a ball against the wheel, a second ball conveying mechanism on said frame including, a second wheel rotatable about an axis and positioned generally above the first wheel and a second arcuately curved guide track spaced from said second wheel, said second guide track having an end adjacent said first guide track and the other end adjacent the ball storage rack with an intermediate part to hold the ball against the second wheel, drive means for rotating said wheels, an overrunning clutch in the drive to the first wheel enabling the first wheel to rotate at a greater speed than that at which the first wheel is driven by said drive means, and overdrive means connected between said drive means and said first wheel for normally rotating said first wheel at said greater speed.

4. A ball lift comprising, a frame; a first ball conveying mechanism mounted on said frame including a first wheel and a first generally semicircular guide track spaced from said wheel, said guide track having a ball entrance end adapted to lie adjacent an alley return track and an intermediate part curved about the periphery of the wheel to hold a ball against the wheel; a second ball conveying mechanism on said frame including a second wheel positioned above the first wheel a distance sufficient to pass a ball therebetween and a second semicircular guide track spaced from the second wheel and facing in a direction opposite to said first guide track, said second guide track having an end positioned to receive a ball discharged from the first guide track and the other end adapted to be positioned adjacent a ball storage device with an intermediate part curved about the periphery of the wheel to hold the ball against the second wheel; means for rotating said wheels in opposite directions whereby a ball rolls in one direction up the first guide track and reverses its rotation while rolling up the second guide track to discharge the ball from the ball lift traveling in generally the same direction as that when entering the ball lift, said means for rotating including a pulley rotatable with the second wheel, a pulley rotatable relative to the first wheel, a one-way clutch connecting the first wheel and the pulley associated therewith permitting overrun of the first wheel relative to the pulley associated therewith, and a first belt trained about the pulleys for rotating the latter; and overdrive means connected between said rotating means and said first wheel for driving said first wheel at a greater speed than that at which said first wheel is driven by said first belt.

5. A ball lift as defined in claim **4** wherein said overdrive means comprises a first pulley fixed to said first wheel, a second pulley positioned adjacent said first belt, and a second belt trained about said first and second pulleys, said first belt frictionally engaging said second pulley to drive said second belt and rotate said first wheel at said greater speed.

6. A ball handling mechanism, comprising, a ball storage rack, a ball return track for returning a ball to an alley approach area and including at least a portion thereof disposed at a level below the level of the storage rack and a ball lift for transferring a ball from said return track portion to said rack including a frame, a wheel rotatable on the frame about a generally horizontally disposed axis and overlying said return track portion, an arcuately curved guide track spaced from the wheel including a ball entrance end adapted to lie adjacent said return track portion, an intermediate part disposed to hold a ball against the wheel, and an exit end for directing a ball in a path leading to said storage rack, a power source, and means connected between said power source and said

wheel for driving the wheel at a variable rate including a normally relatively rapid rate when a ball enters and a relatively slower rate when the ball is discharged.

7. Apparatus for transferring a ball from a ball receiving zone towards a ball discharging zone comprising: a track extending from said receiving zone towards said discharging zone, means for engaging a ball on said track for propelling the ball along the track from the receiving zone towards the discharging zone, a power source, and means connected between said power source and said engaging means for driving said engaging means at a variable rate including a normally relatively rapid rate when a ball enters the apparatus and a relatively slower rate when the ball is discharged.

8. Apparatus for transferring a ball from a ball receiving zone towards a ball discharging zone, comprising: a track extending from said receiving zone towards said discharging zone; means for engaging a ball; means for driving said engaging means for propelling a ball along said track; a one way clutch comprising, a first part associated with the engaging means, and a second part associated with said first part so that there can be relative rotation of said parts in one direction but not in the opposite direction; said driving means including first means for driving said second part at a selected speed and second means for driving said first part with said engaging means at a speed normally greater than said selected speed so that there is relative rotation of said parts in said one direction, the first and second means being arranged so that in operation a load applied to the first part causes the engaging means to slow from said normally greater speed to said selected speed; whereby a ball is smoothly slowed from a high entering speed at the receiving zone to the selected speed at the discharging zone.

9. A ball handling mechanism, comprising, a ball storage rack, a ball return track for returning a ball to an alley approach areas and including at least a portion thereof disposed at a level below the level of the storage rack and a ball lift for transferring a ball from said return track portion to said rack including a frame, a wheel rotatable on the frame about a generally horizontally disposed axis and overlying said return track portion, an arcuately curved guide track spaced from the wheel including a ball entrance end adapted to lie adjacent said return track portion, an intermediate part disposed to hold a ball against the wheel, and an exit end for directing a ball in a path leading to said storage rack, drive means for rotating the wheel at a predetermined speed including an overrunning clutch enabling the wheel to rotate at a greater speed than said predetermined speed for engagement of said wheel with a ball moving rapidly into said entrance end, and overdrive means connected between said drive means and said wheel for normally rotating said wheel at said greater speed, said overdrive means providing a slip drive for said wheel whereby said ball can be discharged from said exit end at a controlled rate.

References Cited by the Examiner

UNITED STATES PATENTS

2,964,318	12/1960	Levendoski	273—49
3,090,477	5/1963	Luek et al.	
3,109,648	11/1963	Anderson et al.	273—49

RICHARD C. PINKHAM, *Primary Examiner.*

ANTON O. OECHSLE, *Examiner.*