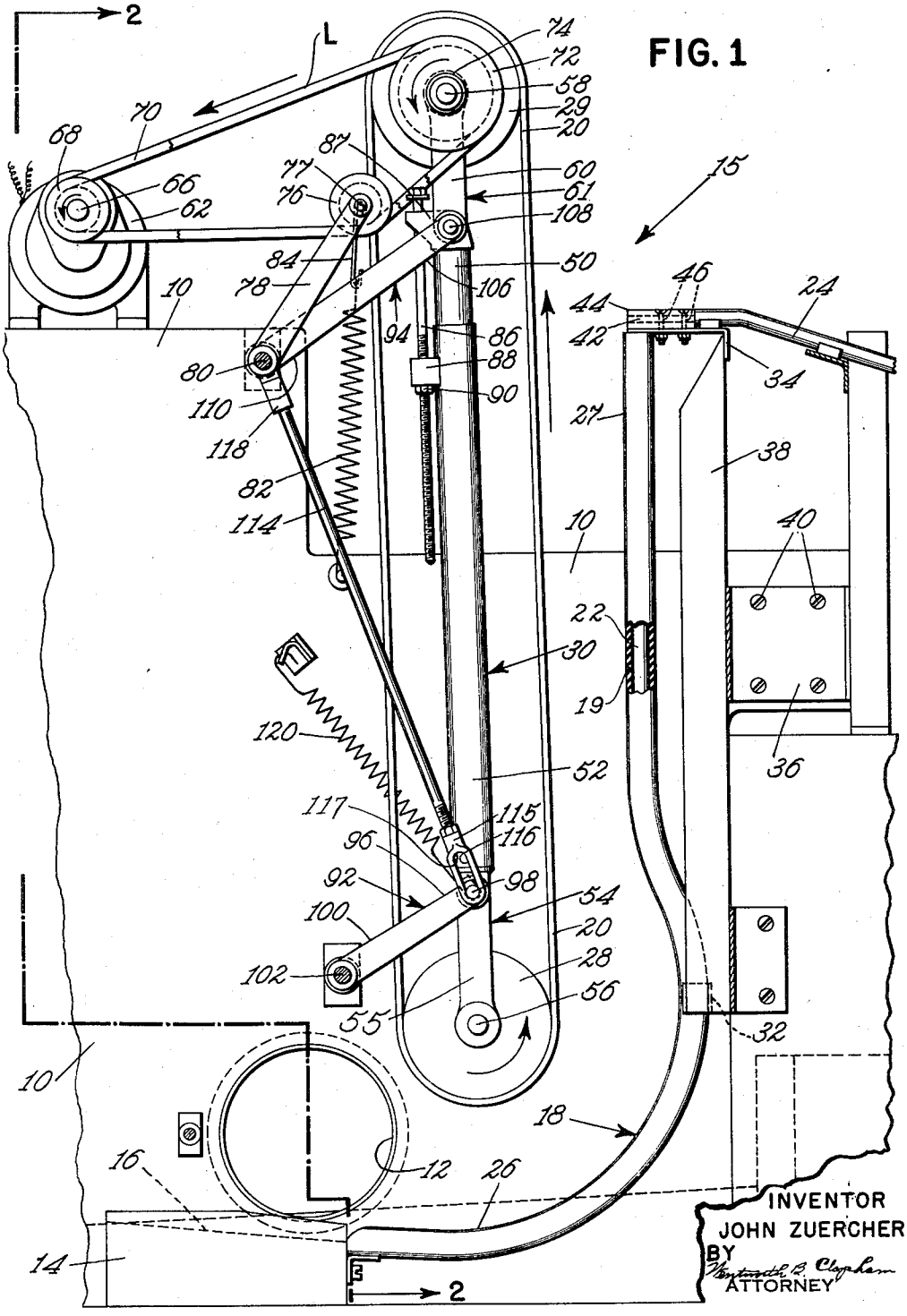
April 5, 1960 J. ZUERCHER 2,931,651

BOWLING BALL ELEVATING APPARATUS

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FIG. 1

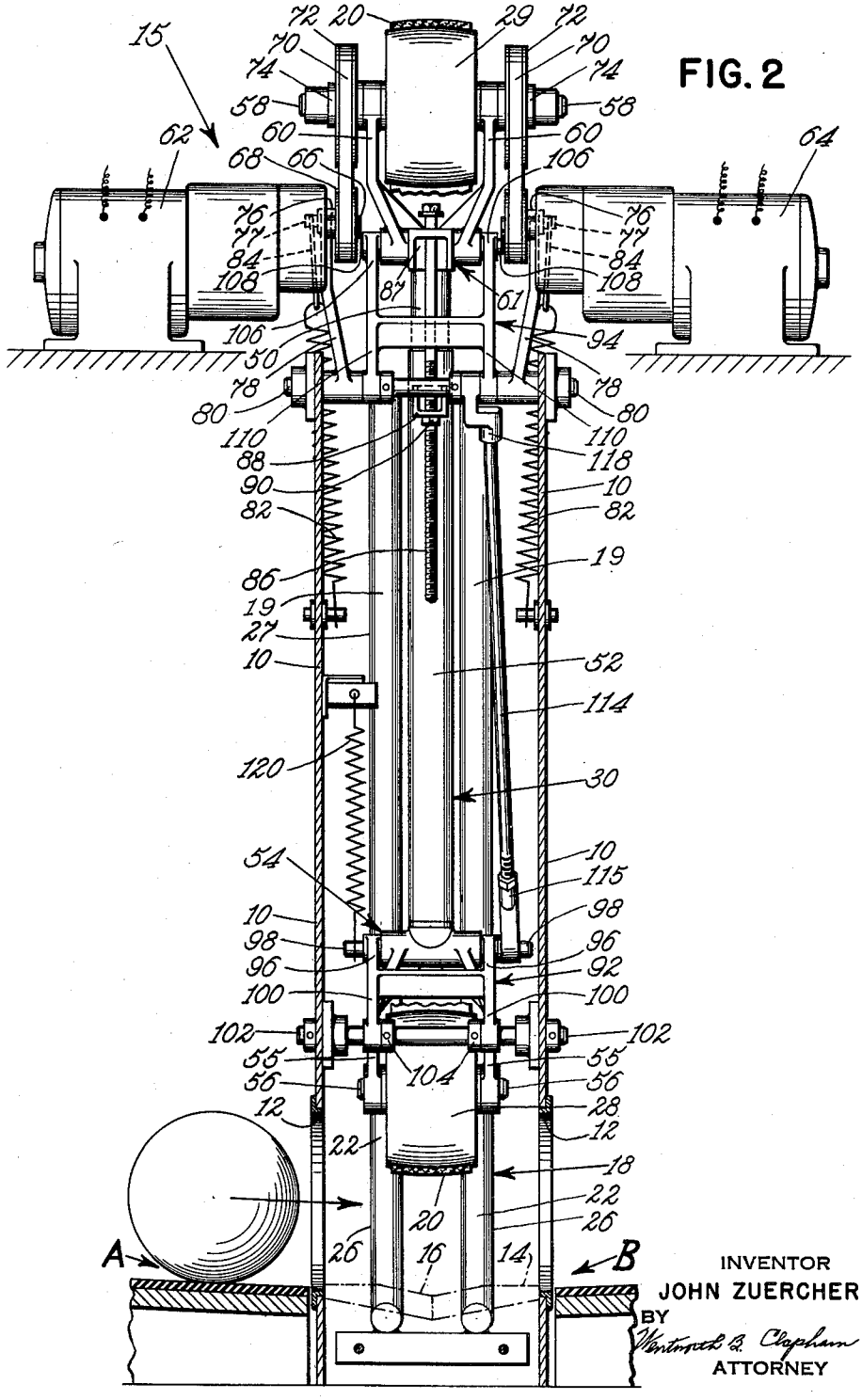


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FIG. 2



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BOWLING BALL ELEVATING APPARATUS

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6 Claims. (Cl. 273—49)

This invention relates to the game of bowling, and more particularly to bowling ball handling and returning apparatus for lifting balls delivered thereto from the pit of one or more alleys and discharging them onto a ball return runway for return to the player at the head of the alley or alleys served.

Apparatus embodying the invention can be used with a single alley, or if desired, with two side by side alleys. If used with two side by side alleys, the ball lifting mechanism is located between the spaced kickbacks of two adjacent alleys in order that balls from either alley can be delivered in any suitable manner, either manually or by mechanical means, through openings in the kickbacks or by suitable guides to the range of operation of the ball lifting mechanism, and be lifted thereby and delivered to a common return runway which serves both alleys.

The ball lifting mechanism embodying the invention consists generally of a stationary track or guide having a curved portion at its lowest portion spaced from a ball engaging and lifting member such as an endless belt. This belt is so mounted with respect to the guide or track that when a ball is delivered into the gripping engagement between the belt and track or guide, the gravity bias of the belt effects a firm, yet resilient gripping of the ball, which is rolled by the belt upwardly along the guide or track to an elevated point of delivery onto the return runway. The construction of the track or guide and its relation to the endless ball conveying belt are such that it is substantially impossible for more than one ball to be gripped by the belt against the track or guide at any one time. The results obtained by this construction are readily apparent. The striking of balls against each other in the ball lifting mechanism is eliminated, and with it damage to balls by chipping and denting. Another important result is the ability of the mechanism to space balls along the ball return runway for a more uniform and systematic returning of balls to the players. Furthermore, because of the manner in which balls are handled one by one there can be no jams occurring in the lifting zone between the belt and track, and hence breakage of parts is prevented.

It is an object of the invention to provide an improved ball handling and elevating mechanism for use with one or more bowling alleys, and wherein only one ball at a time can be elevated to the point of discharge.

It is a further object of the invention to provide an improved ball handling and elevating mechanism having ball lifting means so constructed and arranged that if more than one ball is delivered into the range of the ball lifting means only one ball of the series can be engaged by the ball lifting means and raised thereby to an elevated point of delivery onto the ball return runway.

The invention is further characterized by the provision of a novel ball lifting and return mechanisms including

an elongated substantially vertical ball track having a curved ball receiving lower end portion and an endless belt having a ball engaging lap extending upwardly in a generally parallel relationship with the track and means for so mounting the belt conveyor that it is moved by gravity bias into ball gripping position relative to the ball track where a ball delivered into the range of the gravity biased belt and the track causes the belt to grip the ball and move upwardly away from the track rolling the ball along the track. At the same time due to the novel construction of the track if a second ball has also been delivered to the mechanism for lifting, the spacing of the lower portion of the belt and the track is such that the belt cannot grip the second ball until the first ball has been discharged onto the return runway at which time the belt moves downwardly, grips the second ball and elevates it for delivery to the return runway.

The invention also consists in the provision of a novel ball lifting mechanism having an endless ball lifting belt which coacts with a stationary track and means for so mounting the belt with respect to a curved portion of the track that only one ball at a time may be rolled by the belt along the track to a point of discharge therefrom.

The invention further consists in the provision of a novel ball lifting and return mechanism including a substantially vertical ball track and an endless ball lifting belt coacting therewith wherein the belt is so mounted that it can roll only one ball at a time along the track to a point of discharge therefrom, and wherein the belt is operative upon discharge of a ball thereby onto a ball return runway to engage the next ball to be lifted and roll it to the point of discharge for delivery onto the return runway.

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 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 side elevation illustrating a preferred embodiment of the invention employed with two side by side bowling alleys.

Figure 2 is a sectional end elevation taken on line 2—2 in Figure 1.

Referring to the drawings, the preferred embodiment of the invention selected for purposes of illustration is mounted between kickbacks 10 of two side by side or adjoining alleys A and B. The ends of the kickbacks are cut away in any suitable manner to make room for installing the ball lift and a space through which a pin boy may move back and forth from the pit of alley A to the pit of alley B in directing balls to the ball lift designated generally 15, and for spotting pins on the pin decks of alleys A and B. If the ball lifting mechanism is used with bowling alleys served with automatic bowling pin spotting machines, the kickbacks are modified only to the extent necessary to provide space for the installation of ball lift 15.

Ball lift 15 is installed between alleys A and B alongside the pits and preferably the bottoms of the pits are inclined as shown in Figure 2 so that balls may roll or be delivered through openings 12 in kickbacks 10 onto a ball receiving block 14 in which is formed an inclined guideway 16 down which balls roll onto track or guide 18 and into position to be engaged by endless belt 20.

As shown in Figure 1 the ball track or guide along which balls are rolled by belt 20 is designated generally 18. This track consists of two spaced rails or ball supporting members 22. In the illustrated embodiment these

rails are formed of tubular rods preferably covered with a resilient material 19 such as rubber tubing which not only protects the balls being handled from damage, but also acts to provide a good holding surface for insuring the best handling of balls against slippage during their travel therealong to the top of the track to the point of discharge onto return runway 24 along which balls roll to the playing position.

The end of the lower portion of track 18 is suitably connected to block 14. This end portion is shaped or curved and provided with a radius such that when a ball rolls from block onto lower curved portion 26 (Fig. 1) of track 18 it will be gripped by the lower portion of belt 20 as it passes around pulley 28 of the belt supporting frame designated generally 30. In general configuration track 18 resembles somewhat an inverted shepherd's crook. The reason for this formation is to provide a ball rolling and supporting surface such that when a ball is being rolled along track 18, by belt 20, it will be firmly yet resiliently held thereby, as it rolls therealong. Furthermore, a second ball delivered onto block 14 and rolling down guide 16 onto track portion 26 cannot be gripped by belt 20, because at that time the latter is rolling the first ball upwardly along upper track portion 27 for delivery onto return runway 24. As will be brought out more fully hereinafter while belt 20 is rolling a ball along track portions 26 and 27, the distance of the lowest point on the periphery of pulley 28 is greater than the diameter of a ball, and hence a second ball on track portion 26 cannot be gripped by belt 20 until the first ball, or that being rolled along track 18 is actually discharged onto return runway 24.

Rails 22 of track 18 are detachably secured by suitable means, such as screws, to bracket 34 mounted on support channel 38, and to block 14. The upper part of curved portion 26 of track 18 is held firmly seated in a strap 32 mounted on the lower portion of channel 38. This construction makes it possible to effect a rapid removal of track 18 from its supports so that when tubing 19 wears, it can be turned on rails 22 so as to present a new ball engaging face, thus contributing to the life of the ball track covering. Bracket 36 is secured by screws 40 to kickbacks 10. In this manner track 18 is firmly secured in its substantially vertical operative position, as shown in Figure 1.

At the top of track 18 is detachably mounted a resilient block 42, preferably formed of rubber provided with suitably shaped ball guide troughs or tracks formed in its opposite faces. This block receives a ball discharged by belt 20 from track 18 with substantially no damage at any time to the ball. Also because of its detachability, when the ball engaged edge 44 wears down, it only requires the removal of screws 46 and the reversing of block 42 to double the life of block 42, without in any way making it less efficient in operation.

Belt supporting frame 30 is generally similar in construction to the belt supporting frame shown in Holloway et al., application Ser. No. 170,162, filed June 24, 1950, for Ball Return Mechanism, now Patent No. 2,776,138, issued January 1, 1957. In the mechanism illustrated herein frame 30 comprises a rod 50 slidably fitted in tube 52. The lower end of tube 52 carries a fork 54 having spaced arms 55 provided with bearings supporting a shaft 56 on which pulley 28 is freely rotatably mounted. A spring (not shown) in tube 52 presses against the free end of rod 50 and the top of a rod portion (not shown) formed on fork 54. The telescoping construction of frame 30 provides an automatic takeup for endless belt 20 running on pulleys 28 and 29, and also properly tensions belt 20 when it is running free, or when it is engaging a ball and rolling it upwardly along track 18 for delivery to return runway 24.

Pulley 29 is fixed to shaft 58 rotatably mounted in spaced arms 60 of a fork 61 suitably attached to rod 50. In the form of the invention selected for illustration, ball lift 15 is used with two alleys provided with automatic bowling pin spotting machines (not shown). Certain of the operating elements of these machines are driven by motors 62 and 64, respectively. When both machines are in use, both motors are running. When only one machine is in use, its respective motor only is in use. These motors are of the gear reduction type. Since the driving connections of each motor to shaft 58 are the same, only one driving connection will be described.

The output shaft 66 of motor 62 mounts a pulley 68 on which runs belt 70 running on and driving a pulley 72 forming a part of a one directional clutch operatively connected to shaft 58. Clutch 74 may be of any suitable conventional type. Belt 70 is tensioned by a tension pulley 76 rotatably supported on an arm 78 pivotally mounted on a cross shaft 80 supported in kickbacks 10. A spring 82 having one end attached to a hook 84 fixed to pivot pin 77 of pulley 76, and its other end attached to a pin on one of the kickbacks 10 maintains proper tension on belt 70.

The extent of outward telescopic movement of rod 50 relative to tube 52 is controlled by elongated adjusting bolt 86. The upper or head portion of bolt 86 is slidably supported in a lug 87 formed on fork member 62. The lower or threaded end portion of bolt 86 is threaded through a lug or boss 88 attached to tube 52. A lock nut 90 bearing against the lower face of boss 84 prevents the rod 50 from being catapulted in case the belt 20 should break by accident.

Frame 30 is supported for movement to and from track 18 by levers 92 and 94. Lever 92 is substantially H-shape in form and is provided with two spaced upper arms 96 pivotally attached to the ends of stud shaft 98 supported in fork 54. Lever 92 also is provided with two lower spaced arms 100 pivotally mounted on shaft 102 having its ends mounted in supports in kickbacks 10. Collars 104 on shaft 102 prevent arms 100 from moving laterally on shaft 102. Lever 94 is substantially H-shaped in form and is provided with two upper arms 106 pivotally attached to stud shaft 108 supported in fork 61. Lever 94 also has two spaced lower arms 110 which are pivotally mounted on a cross shaft 80.

Referring to Figure 1 it will be seen that the extent of movement of frame 30 downwardly towards track 18 is controlled by a rod 114 which at its lower end is threaded to adjustably support a block 115 having an elongated eye 116 in which is seated one of the free ends of shaft 98. The upper end of rod 114 is provided with a hub 118 pivotally mounted on shaft 80. A spring 120 having one end connected to a kickback 10 and its other end attached to shaft 98 serves to partially counterbalance the weight of frame 30.

The extent of movement of frame 30 upwardly away from track 18 is controlled by the engagement of one of the free ends of shaft 98 with the top end 117 of elongated eye 116. This upward stop prevents frame 30 from bouncing up and down as a ball rolls onto track portion 26 and with engagement with belt 20 and also insures sufficient pressure of belt 20 against a ball.

In operation when a ball rolls through one of the openings 12 in a kickback it is guided down inclined guideway 16 and into engagement with belt 20 as it passes around pulley 28. The coaction between belt 20 and track portion 26 is such that when a ball is engaged by belt 20 it will immediately be rolled thereby along the full length of curved track portion 26 and thence upwardly along track portion 27 to the point of discharge from track portion 27 onto rubber block 42 and from there it rolls onto return runway 24 of which block 42 forms a part.

As the result of the engagement of a ball by belt 20 as it rolls along track portion 26, the entire frame 30 is moved upwardly away from track portion 26 and track portion 27. The amount of movement of frame 30 upwardly and to the left, as viewed in Fig. 1, away from

track 18 is such that belt pulley 28 and belt 20 passing thereabout are positioned a distance from track portion 26 greater than the diameter of a ball such that belt 20 cannot engage a second ball rolling onto track portion 26 while the first ball engaged by belt 20 is being rolled along track 18 for delivery onto return runway 24.

Referring to Fig. 1, it will be seen that when belt 20 is rolling a ball upwardly along track 18, the relationship between the pivot shaft 80 of lever 94 and lever 92 on pivot shaft 102 results in the movement of levers 92 and 94 in a counterclockwise direction and insures that so long as a ball is being pressed by belt 20 against track 18, frame 30 will be maintained in its upper position and will so remain until this ball is discharged onto return runway 24. By means of the reverse curve in track 18, at the point where the top of curved track portion 26 joints the straight portion 27, the latter portion is substantially parallel with belt 20 and closer thereto than the diameter of a ball, thus insuring a continued upward thrust relative to lever 94, and also lever 92, which is operative to maintain frame 30 against downward movement until a ball is delivered onto return runway 24. In other words, a ball being rolled by belt 20 upwardly on track 18 moves to the left as viewed in Fig. 1, as it rolls off track portion 26 onto track portion 27 where because of the closer spacing between belt 20 and track 27, the ball is more firmly held, thereby in effect locking the frame 30 against downward movement until the ball has been discharged by the belt onto return runway 24.

The upward movement of frame 30 is also due in part to the movement of a ball into engagement with belt 20 as it passes around pulley 28. The coaction between belt 20 and track portion 26 is such that the upper lap of belt 70, designated L, is substantially immediately tightened as a result of the entry of the ball therebetween. As soon as lap L of belt 70 tightens, levers 92 and 94, which support frame 30, are swung in a counter clockwise direction, as viewed in Figure 1, thereby lifting frame 30. The fact that frame 30 is lifted partially by the tightening of lap L of belt 70 prevents balls from slapping at their point of entry into engagement with belt 20 as they roll onto track portion 26. This structure also increases the life of the belt and the life of tubing 19. After a ball has been discharged, frame 30 moves downwardly by gravity and against the pull of spring 120 into position ready to lift the next ball delivered onto track portion 26.

The feature in the operation of the mechanism which results in frame 30 remaining in its upper position is that as soon as a ball rolling onto track portion 26 is engaged by belt 20 and rolled thereby, it substantially immediately tensions lap L of belt 70. As lap L tensions, arms 92 and 94 move in a counter clockwise direction, thereby assisting in the raising or lifting of frame 30, and in holding frame 30 in its upper position, which is controlled by the engagement of one end of shaft 98 with the top end 117 of eye 116 in block 115 on rod 114, which acts as a stop so that frame 30 cannot move beyond this point.

The ball lifting mechanism embodying the invention is simple in construction and operates in such manner that balls delivered thereto from one or more alleys are moved in spaced succession upwardly away from the pit zone of the alley or alleys and delivered in a minimum of time to players for the further play of the game.

What I claim is:

1. In a bowling ball return apparatus comprising a substantially vertical ball return track having a ball receiving portion, and a ball delivering portion, support means mounting said track with said ball receiving portion adjacent the pit of a bowling alley and said delivering portion substantially in alignment with an elevated bowling ball return runway, an endless conveyor spaced from said track and having an active ball delivering lap and an inactive return lap, means mounting said conveyor with said ball delivering lap thereof normally positioned to engage a ball delivered from said pit onto said receiving portion of said track, said means including pivotal supports positioned adjacent the inactive lap of said conveyor and operative to permit movement of said conveyor upwardly away from said track in response to its engagement with a ball to a position above said receiving portion of said track greater than the diameter of a ball, said ball being operative to maintain said conveyor in said elevated position until said engaged ball is delivered onto said runway, whereby the next ball to be delivered to said runways remains out of contact with said conveyor until said first named ball has been delivered to said runway, and means for driving said conveyor to roll said ball engaged thereby upwardly along said track for delivery by said delivery portion onto said runway.

2. A bowling ball return apparatus comprising a substantially vertical ball track, said track having a lower curved ball receiving portion and an upper substantially straight ball delivery portion, and a reverse curve section connecting said lower and upper portions, supports mounting said track with said ball receiving portion positioned adjacent the pit of a bowling alley, guide means for directing a ball onto said receiving portion, a conveyor having an endless ball engaging and conveying surface, means mounting said conveyor for movement to and from said track, including means positioning said surface for engagement with a ball on said receiving portion of said track, said conveyor mounting means being adapted to move substantially the entire ball engaging and conveying surface simultaneously away from said track as a ball is traveled therealong, said track being operatively disposed so that the reaction force effected by said engaged ball being traveled by said surface from said lower curved portion along said reverse curve section onto said upper straight portion is operative to maintain said conveyor a distance spaced from said curved portion greater than the maximum diameter of a bowling ball whereby only one ball at a time can be gripped by said surface and said track, and means for driving said conveyor to travel a ball engaged by said surface up said track for discharge from said delivery portion.

3. A bowling ball handling device comprising a substantially vertical ball track, including two spaced elongated tubular members having a straight upper portion and a curved lower ball receiving portion, a ball return runway, a shock absorbing guide member mounted between said ball return runway and the end of said upper straight portion of said track, a ball engaging and lifting conveyor having a traveling ball engaging surface with an active ball engaging section and an inactive return section, supports mounting said conveyor for movement to position said surface in ball engaging and lifting position relative to said ball, said supports including spaced pivotal members positioned adjacent said inactive return section, mechanism operative in response to the arrival of a ball between said curved ball receiving portion of said track and said surface of said conveyor for causing said surface to firmly hold said ball on said surface to roll said ball up said track, said lower ball receiving portion of said track provided with a reverse curve portion adjacent the ball engaging zone of said track to insure positive coaction between said surface and said track as a ball is rolled from lower curved portion to said upper straight portion and onto said return runway, said ball being operative in response to its engagement by said surface and delivery thereby from said curved portion along said reverse curve portion onto said upper straight portion for rendering said surface inoperative to engage a second ball awaiting delivery until said first ball engaged by said conveyor has been delivered thereby onto said return runway.

4. In a bowling alley installation having two side by side alleys separated by spaced kickbacks, a bowling ball return apparatus positioned between said kickbacks, said apparatus comprising a bowling ball track having a ball delivery portion and a ball receiving portion, a ball return runway positioned to receive a ball discharged from said delivery portion, a ball engaging and lifting conveyor, supports mounting said conveyor in spaced relation with said track, and for upward and outward movement relative to said track, means for positioning a bowling ball delivered through an opening in either of said kickbacks from the pit of either of said alleys between said conveyor and track, and means for driving said conveyor to travel said ball along said track and onto said return runway, said conveyor being operative in response to its engagement with a ball on said track to move away from said ball receiving portion and upwardly away from said ball delivery portion of said track a distance greater than the diameter of a ball, and means for displacing said ball laterally against said conveyor as said ball is traveled from said ball receiving portion of said track to said ball delivery portion to maintain said conveyor in elevated position, whereby a second ball delivered through said openings cannot be engaged by said conveyor until said first ball has been delivered thereby onto said return runway.

5. A bowling ball handling device comprising a substantially vertical ball track, having a straight upper section and a curved lower ball receiving section, a ball return runway located adjacent the discharge end of said straight portion, a ball engaging and lifting conveyor having a traveling ball engaging surface, supports mounting said conveyor for movement to position said surface in ball engaging and lifting position relative to said track, mechanism operating in response to the arrival of a ball on said curved ball receiving section of said track and for engagement thereof with said surface of said conveyor for causing said surface to firmly hold said ball on said track, means for driving said conveyor, whereby said surface rolls said ball up said track and onto said return runway, and means supporting said surface and operative in response to the engagement of said ball by said surface for moving substantially the entire surface simultaneously away from said track as a ball is traveled therealong, whereby said surface is inoperative to engage a second ball awaiting delivery onto said ball return runway and means for displacing said ball laterally against said surface as said ball is traveled from said ball receiving section of said track to said upper section to maintain said surface in elevated position and out of engagement with said second ball until said first ball has been discharged onto said runway.

6. A bowling ball return apparatus comprising a substantially vertical ball return track, a ball return runway positioned to receive balls delivered from said track, an endless belt conveyor having a ball engaging lap spaced from and extending along said track and a return lap remote therefrom, frame means supporting said conveyor, means for delivering a ball between said track and said frame to cause said ball to be gripped by said ball engaging lap of said belt and said track, and means for driving said conveyor to cause said ball engaging lap of said conveyor to roll said ball upwardly along the track for delivery onto said return runway, vertically spaced levers each having one end thereof pivotally connected to and mounting said frame means for movement towards and away from said track, means pivotally supporting the other ends of each of said levers adjacent said return lap and vertically below the centers of the pivots connecting said levers to said frame means, said levers being constructed and arranged to allow said frame means to move downwardly and towards said track under the influence of gravity, whereby said ball is operative in response to its engagement with said belt and its movement along said track to move said belt and frame upwardly and away from said track, and means for displacing said ball laterally against said ball engaging lap of said belt as said ball is traveled thereby along said track to maintain said levers and said frame means against downward movement preventing said belt from lifting more than one ball at a time.

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