Dec. 13, 1960 A. E. LEVENDOSKI 2,964,318

BOWLING BALL HANDLING AND RETURN MECHANISM

Filed June 10, 1957 2 Sheets-Sheet 1

FIG. 1

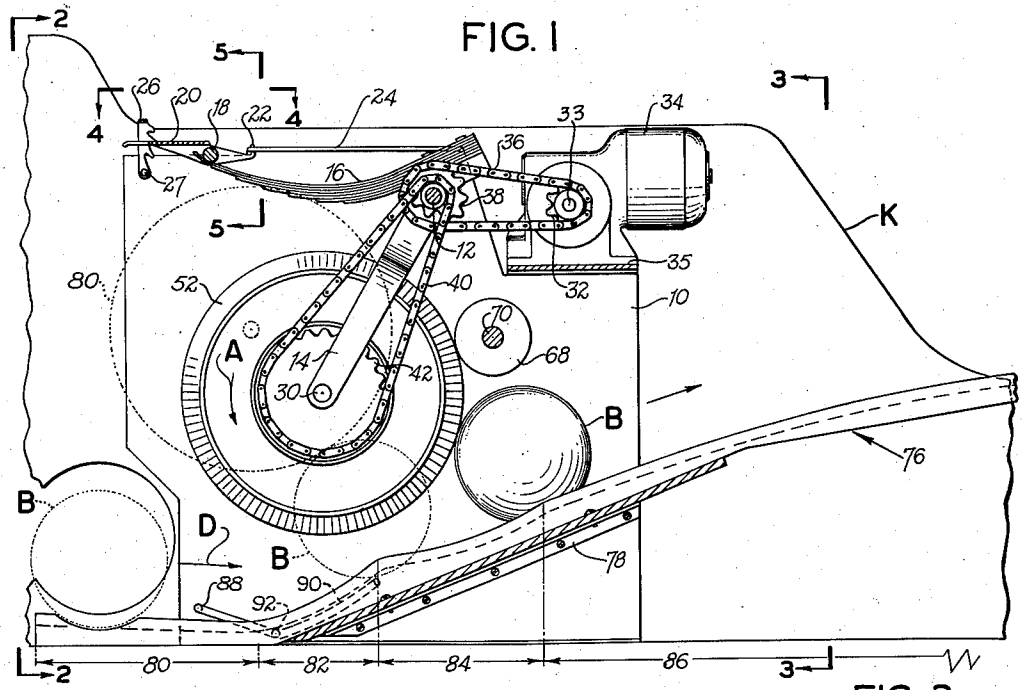


FIG. 2

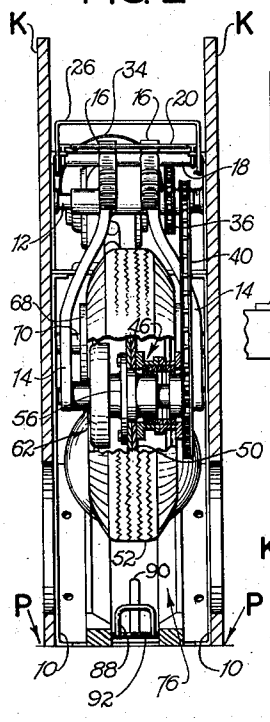


FIG. 4

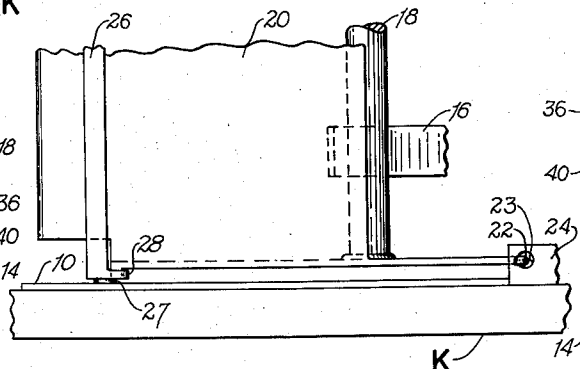


FIG. 5

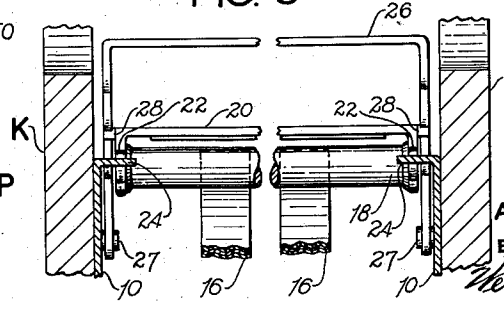
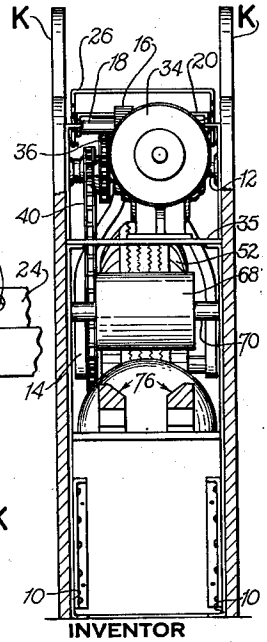


FIG. 3



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BOWLING BALL HANDLING AND RETURN MECHANISM

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FIG. 6

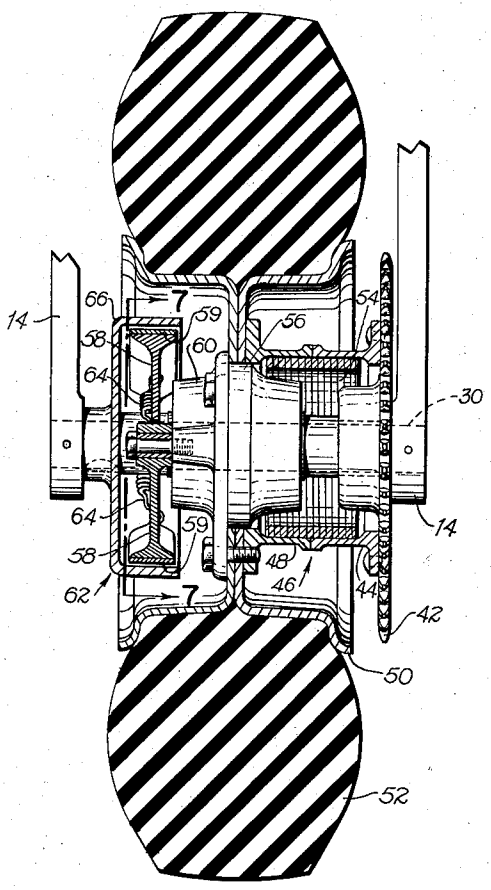
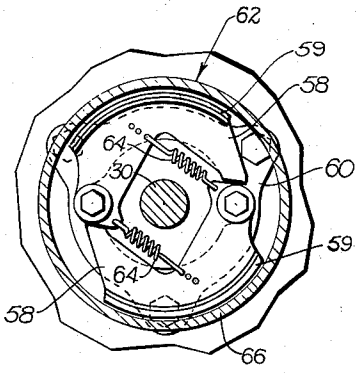


FIG. 7



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BOWLING BALL HANDLING AND RETURN MECHANISM

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13 Claims. (Cl. 273—49)

This invention relates to bowling ball handling and return mechanisms, and more particularly to apparatus operative to return a bowling ball delivered into its range of operation from a pit of a bowling alley to a player at the head of a bowling alley.

In many bowling establishments, it is customary to provide a common ball return for use with two adjacent bowling alleys, the ball return being located between two alleys. With this type of arrangement, when balls are delivered from the pit of the alleys to the bowling ball return either manually by a pin boy or by mechanical means, such as disclosed in Zuercher et al. Patent No. 2,765,172, dated October 2, 1956, for Bowling Ball Handling and Return Mechanism, such balls are elevated to a ball discharge position at some distance above the pit, and delivered onto a bowling ball return runway having a down sweep section along which the balls roll onto the return runway extending along the alley and finally come to rest in a ball return rack at the head end of a bowling alley.

According to the invention, however, mechanism is provided which eliminates the necessity of raising each ball to an elevated position for gravity return to the head end of an alley because of the provision of positive means which engages each ball delivered from the pit of a single alley or the pits of adjacent bowling alleys which is operative to propel each ball positively along the ball return runway which extends along the alley and thence to a ball storage rack where balls are accessible to the players.

As shown herein for purposes of illustration, my improved bowling ball return mechanism is shown in combination with two side by side bowling alleys having a common ball return runway.

It is an object of the invention to provide an improved bowling ball handling and return mechanism for use with bowling alleys in effecting a substantially straight-out direct return of each ball to the playing end of a bowling alley.

It is a further object of the invention to provide a mechanism adapted to receive bowling balls from the pits of two adjacent bowling alleys and wherein means are provided for engaging and propelling each ball along the bowling ball return runway which extends along and parallel to two adjacent bowling alleys into a storage rack at the head of the bowling alleys.

The invention is further characterized by the provision of a positively acting bowling ball return device in the form of a relatively slowly driven wheel provided with a pneumatic tire. When a ball is engaged by the tire and pressed thereby against a portion of the runway, the wheel is forced upwardly against the tension of a spring forming a part of the mechanism which stores sufficient energy to accelerate the ball when the latter moves from beneath the tire onto the open runway track which extends along the alley or alleys for return to the ball storage rack at the head of the bowling alley or alleys where it is available for use by the player.

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 character of reference indicate the same or like parts:

Fig. 1 is a side elevation illustrating a preferred embodiment of the invention as employed with two adjacent bowling alleys.

Fig. 2 is a view taken on line 2—2 in Fig. 1.

Fig. 3 is a view taken on line 3—3 in Fig. 1.

Fig. 4 is a view taken on line 4—4 in Fig. 1, and

Fig. 5 is a view taken on line 5—5 in Fig. 1.

Fig. 6 is a cross sectional end elevational view of a ball handling and return mechanism embodying the invention.

Fig. 7 is a view taken on line 7—7 in Fig. 6.

Referring to Figures 1 through 5, the bowling ball return mechanism selected to illustrate the invention is mounted between kickbacks K adjacent the pits P of two adjacent alleys (not shown). Mounted on opposed surfaces of kickbacks K, as viewed in Figures 2 and 3, are plates or side frames **10** supporting stationary shaft **12**. A yoke support **14** is pivotally mounted with suitable bearing to shaft **12**. Secured to upper end of yoke support **14** are suitable springs which function as described hereinbelow. In the illustrated embodiment the springs comprise a plurality of flat metal strips or leaves forming leaf springs, designated generally **16**. As illustrated in Figure 2, two leaf springs **16** are used. As shown in Figures 1, 2, 4 and 5 the free ends of springs **16** rest against rod **18** which is secured to adjustment plate **20**. The edges of plate **20** are provided with suitable attaching means, such as hooks **22** (Figure 4), which when engaged in recesses **23** in flange **24** of side frames **10** provide a fulcrum point for adjustment plate **20**. Adjustment ratchet **26**, generally U shaped is pivotally mounted on lugs **27** supported in side frames **10**.

In order to increase or decrease the preloading of springs **16**, plate **20** is depressed and lugs **28** on adjustment plate **20** (Figures 4 and 5) are thereby disengaged from the ratchet teeth of adjustment ratchet **26**. Adjustment ratchet **26** is then moved about its pivot **27** away from adjustment plate **20**. When the desired loading of springs **16** is effected, ratchet **26** is moved in the opposite direction to engage lugs **28** with higher or lower teeth of adjustment ratchet **26** as the case may be.

Sprocket **32** is fixed to and rotates with shaft **33** which is driven by gear motor **34**, suitably mounted on support plate **35**, carried by side frames **10**, or any other suitable means. Sprocket **32** drives chain **36** which in turn drives compound sprocket **38** freely rotatably mounted on shaft **12**. Compound sprocket **38** drives chain **40** which in turn drives sprocket **42** mounted on shaft **30**, as shown in Figures 1, 2, 3, 6, and 7; is supported in the lower spaced ends of yoke support **14**.

Referring to Figure 6, sprocket **42** is fixed to and drives input housing **44** of over running spring clutch designated generally **46**. The output housing **48** of over running spring clutch **46** is fastened to wheel rim **50** on which is mounted a ball engaging and propelling wheel **52** having a compressible peripheral surface preferably formed of sponge rubber or of pneumatic construction such as a conventional automobile tire. Rim **50** is attached to hub **56** rotatably mounted on shaft **30**.

Coil spring **54** is wound around shaft **30** and is contained in input housing **44** and output housing **48** of over running spring clutch **46**. As sprocket **42** is rotated in the direction of arrow A shown in Figure 1, input

housing 44, being fixed to sprocket 42, rotates also. Coil spring 54, exerting outward pressure against the inside diameter of input housing 44, tends to become unwound as input housing 44 rotates in response to the rotation of sprocket 42. As coil spring 54 is unwound, frictional contact is established with the inside diameter of output housing 48 causing it to rotate in the same direction as that of input housing 44 and sprocket 42. Output housing 48, in turn, by means of the connections described heretofore, causes rim 50, hub 56 and wheel 52 to rotate in the same direction as sprocket 42 or that indicated by arrow A in Figure 1.

Brake shoes 58 provided with brake linings 59, are pivotally mounted on support plate 60 of centrifugal brake designated generally 62 and are controlled by springs 64. Plate 60 is secured to and rotates with hub 56 while brake drum 66 is fixed to shaft 30, such as by keying, and is stationary.

Wheel 52, preferably continuously driven at a slow rate of speed in the direction as indicated by arrow A in Figure 1, rests against roller 68 rotatably mounted on shaft 70 supported in side frames 10. Rollers 68 acts as a downward limit stop for wheel 52 relative to the ball return track, designated generally 76 which is secured to brackets 78 fixed to side frames 10.

Ball return track 76 has four functional surfaces. Referring to Figure 1, surface 80 is a straight line surface pitched downwardly from the rear of the unit; i.e., the rear of kickbacks K or pit P to its junction point with surface 82. Surface 82 is a concave surface starting from a point tangent to surface 80 which if continued, would intersect the periphery of wheel 52 in its non-operative position adjacent roller 68. Surface 84 is a concave surface having a radius larger than that of wheel 52, and positioned so that the distance between the periphery of wheel 52 and surface 84 becomes greater in the direction of ball travel along track 76, thereby preventing the periphery of wheel 52 and surface 84 from occupying concentric positions. Surface 86 can be straight, convex, concave, or a combination thereof depending on the vertical height of ball return track 76.

A bowling ball or balls B delivered to the bowling ball handling and return mechanism from pit P of a bowling alley or alleys on either side of said mechanism is received on surface 80, and rolls by gravity, in the direction indicated by the arrow D (shown in Figure 1) until it contacts surface 82 and is engaged by the compressible peripheral surface or tire of wheel 52. Upon reaching surface 82 the ball is held between the outer periphery or tire of wheel 52 and surface 82 and the rotary motion and speed of wheel 52 is imparted by frictional engagement to ball B which is rolled upwardly on surface 82. Wheel 52, under load by the preadjusted tension of spring 16, tends to restrict the spacing between the lowermost point on the periphery or tire of wheel 52 and surface 82 permitting an apparatus embodying the invention to engage and propel bowling balls of varying diameters and weights.

Since the distance between the lowermost point on the periphery of wheel 52 and surface 82 is smaller than the diameter of a bowling ball, as ball B is rolled up surface 82 as indicated by the broken lines, Figure 1, yoke support 14 is pivoted about shaft 12, raising wheel 52 to position 80 as indicated in broken lines. Figure 1. When wheel 52 assumes position 80, spring 16 is placed under further tension and becomes an energy storing device until ball B is rolled onto surface 84. As ball B passes the transition point between surfaces 82 and 84, the energy stored in spring 16 is released and imparted to ball B through yoke support 14 and the compressible periphery of wheel 52. Surface 84 is constructed so that its contour will generally follow rather than break sharply away from the periphery of wheel 52, insuring that both rotational and linear velocity are imparted to ball B when spring 16 discharges its stored energy.

As spring 16 discharges its energy wheel 52 is rotated faster than its driven speed, causing clutch 46 to disengage preventing damage to the driving mechanism. This is accomplished by output housing 48, which when rotated about spring 54 tends to wind spring 54, thereby decreasing the outside diameter of spring 54, and reducing frictional contact between spring 54 and the inside diameters of housings 48 and 44. The increased rotational velocity of wheel 52 further insures imparting of rotational as well as linear energy to ball B.

Ball B assumes position as indicated by solid lines in Figure 1, wheel 52 returns to its position adjacent roller 68 and ball B ceases contact with the periphery of wheel 52 having been imparted with sufficient linear and rotational energy to travel onto surface 86 for return to a ball storage rack at the head of a bowling alley or alleys. Surface 86 can be made to conform to any vertical height permitting use of a ball return mechanism embodying this invention in conjunction with ball return tracks of varying vertical heights.

The inertial forces of bowling balls propelled by wheel 52 will vary according to their respective weights. However, the actual ball speed along return track 76 must be controlled to prevent damage to the associated ball checks (not shown) at the head end of the alley. This is accomplished by the centrifugal brake mounted on wheel 52. When wheel 52 has reached a pre-determined speed, the centrifugal force present at that speed acts on pivotally mounted brake shoes 58 overcoming the tension in springs 64 causing brake linings 59 on brake shoes 58 to come into frictional contact with brake drum 66. This has the effect of holding the maximum speed of wheel 52 constant, even though the resistive forces of bowling balls propelled by wheel 52, vary thereby controlling the ball speed along return track 76.

After bowling ball B is propelled by wheel 52 along return track 76, wheel 52 is rotated faster than its driven speed, as described hereinabove, as it assumes its non-operative position adjacent roller 68. Roller 68 is preferably of high inertial construction which operates to decelerate wheel 52 when engaged thereby to its driven speed, ensuring proper contact between the periphery of wheel 52, surface 82 and the next succeeding ball.

A ball spacing mechanism, illustrated in Figures 1 and 2, is provided in the present invention to insure adequate spacing between succeeding balls held and propelled by the novel ball return mechanism thereby preventing any collision of balls and ball damage. Rod 88, generally U shaped, and arm 90, generally a single rod, are fixed to shaft 92 as by welding. Shaft 92 is pivotally supported in side frames 10. When ball B contacts surface 82, it also contacts and depresses arm 90 which fixed to rod 88 and pivotally mounted on shaft 92, when depressed, raises rod 88 preventing succeeding balls from entering the ball return mechanism until ball B passes the transition point between surfaces 82 and 84, at which time ball B no longer contacts arm 90. Since rod 88 is substantially heavier than rod 90, rod 88 pivots either by gravity or the depressing force created by the next succeeding ball B to a recess provided in track 76, thereby permitting ball B to roll from surface 80 onto surface 82. When there are no balls occupying the position of ball B on surface 80, rod 88 will pivot about shaft 92 by gravitational action alone into recess in track 76 making the ball return mechanism operative for the next bowling ball received in pits P of either alley.

What I claim is:

1. Bowling ball handling and return apparatus for use with a bowling alley having a pit at one end, an alley kickback, having a ball opening through which a ball may be delivered out of said pit, a track located adjacent said pit having a ball-receiving portion and a ball-return portion, a rotatable wheel provided with a compressible peripheral surface located above said track, a frame supporting said wheel, a rotatable stop for engaging said

compressible peripheral surface limiting the downward movement of said wheel relative to said track, means mounting said frame for vertical movement of said wheel relative to said track and means for driving said wheel.

2. The invention defined in claim 1 including means connected to said frame for yieldably urging bowling balls along said ball-return portion of said track.

3. The invention defined in claim 1 wherein said means mounting said frame includes a shaft supported in said kickback pivotally connected to the upper end of said frame.

4. In a bowling alley having a pit at one end, a bowling ball handling and return apparatus comprising a ball-receiving and return track adjacent said pit, a rotatable wheel provided with a resilient tire positioned above said track, a frame supporting said rotatable wheel in spaced relation above said track, a resilient energy-storing and releasing device, means attaching said resilient device to said frame and means for rotating said wheel whereby when a ball on said track is engaged by said wheel, said wheel moves upwardly away from said track and energy is stored in said device, said device being operative to release said stored energy in response to the movement of said ball out of engagement with said wheel and thereby to accelerate the movement of said ball along said track.

5. In a bowling alley having a pit at one end, a bowling ball handling and return apparatus comprising a ball-receiving and return track adjacent said pit, a rotatable wheel provided with a resilient tire positioned above said track, a frame supporting said rotatable wheel, a transverse check roller to limit downward movement of said wheel relative to said track, a resilient energy-storing and releasing device, means attaching said resilient device to said frame and means for rotating said wheel whereby when a ball on said track is engaged by said wheel, said wheel moves upwardly away from said track and energy is stored in said device, said device being operative to release said stored energy in response to the movement of said ball out of engagement with said wheel and thereby to accelerate the movement of said ball along said track.

6. The invention defined in claim 5 including a member comprised of offset sections, a shaft supported in said track adjacent said ball-receiving section and pivotally mounting said member at the point of offset operative to engage bowling balls as they are received onto said ball-receiving section and to space the delivery of said balls into engagement by said tire and said ball-return section of said track.

7. In a bowling alley having a pit at one end, an alley kickback having a ball opening, a bowling ball handling and return mechanism comprising a track adjacent said pit having a ball-receiving section adjacent and below said ball-opening in said kickback, a contiguous upwardly inclined section, a transition point, a second contiguous upwardly inclined portion of lesser inclination co-acting with a ball-return portion of said track, a rotatable wheel located above said inclined portions of said track provided with a pneumatic tire, a support mounting said wheel in spaced relation above said track, means for driving said wheel, an energy-storing and releasing device, means mounting said device in spaced relationship with said tire and said inclined sections of said track whereby, as a bowling ball is gripped by said tire and propelled along said first inclined portion of said track, said tire imparts energy to said device, said device being operative to release said energy to said tire as said ball passes said transition point onto said second inclined portion of said track, said tire thereby propelling said ball along said ball-return portion of said track.

8. Bowling ball handling and return apparatus for use with a bowling alley having a pit at one end, an alley kickback having a ball-opening through which a ball may roll out of said pit, a track located adjacent said pit

having a ball-receiving section adjacent and below said ball-opening and a ball-return section, said ball-return section provided with an inclined portion adjacent the ball-receiving portion and a second contiguous portion of lesser inclination, a rotatable wheel with a pneumatic tire positioned above said track for engaging balls delivered thereto by said ball-receiving section of said track and propelling said balls along said ball-return section of said track, a frame supporting said wheel in spaced relation above said track means for driving said wheel, a spring means comprising a plurality of elongated resilient laminae, means mounting said laminae on said frame in spaced relationship with said tire and said inclined sections of said track whereby said laminae are compressed by said tire as said bowling balls are gripped by said tire and propelled along said first inclined portion of said ball-return section of said track, said laminae being operative, upon the release of said compression, to impart acceleration to said balls through said tire as said gripped balls pass the point of transition between said first and second inclined portions of said track, thereby urging said balls along said track to the head-end of said alley.

9. Bowling ball handling and return mechanism for use with two adjacent bowling alleys each of said alleys having a pit at one end and alley kickbacks at opposite sides of said pit, provided with a ball opening through which a ball may roll out of said pit, a track located adjacent said pits having a ball receiving section adjacent and below said ball openings and a ball-return section, said ball-return section provided with a peak portion and an alternate valley-like portion of said track, a rotatable wheel with a pneumatic tire, positioned above said track for engaging balls on said track and urging said balls along said track, a frame supporting said wheel in spaced relation above said track, an elongated resilient laminar spring device, means mounting said spring device on said frame in spaced relationship above said tire and said peak portion of said track whereby said spring device is compressed by said tire as said balls are gripped by said tire and urged over said peak portion of said ball-return section, said spring release being operative upon the release of said compression to impart acceleration to said ball through said tire as said engaged ball passes said peak portion into said valley-like portion of said track, and onto the portion of said ball-return track extending to the head-end of said alley.

10. In a bowling alley having a pit at one end, a bowling ball handling and return mechanism comprising a ball-receiving and return track adjacent said pit, a rotatable wheel having a ball-engaging and propelling tire located above said track for engaging and propelling a bowling ball along said track from said pit to the head end of said alley, a frame supporting said wheel, a free-wheeling clutch for driving said wheel comprising a coil spring and split housing mounted on said wheel, means for driving said clutch, a self-actuating centrifugal brake mounted on said wheel for limiting the speed of said wheel, and a spring means mounted on said frame urging said wheel into operative position relative to said track, said spring means being operative to rotate said wheel faster than driven speed upon the release of a bowling ball by said wheel whereby said ball is accelerated toward the head end of said alley.

11. In a bowling alley having a pit at one end, a bowling ball handling and return mechanism comprising a ball-receiving and return track adjacent said pit, a rotatable wheel located above said track, a frame swingably supporting said wheel, means for driving said wheel, a spring means comprising a plurality of elongated resilient members secured at one end to said frame, a lever mounted adjacent the free ends of said resilient members, a ratchet pivotally supported for engaging said lever in a plurality of positions increasing or decreasing, as desired, the tension in said spring means in accordance

with the relative position of the free ends of said resilient members and said wheel.

12. The invention defined in claim 11 wherein said lever includes a plate freely mounted at one end and located above the free ends of said resilient members, an elongated member secured to said plate and positioned adjacent and transverse to said free ends of said resilient members.

13. In a bowling alley having a pit at one end, a bowling ball handling and return mechanism comprising a ball-receiving and return track adjacent said pit, a rotatable wheel located above said track for engaging and urging bowling balls along said track from said pit to the head end of said alley, free wheeling drive means mounted on said wheel, a frame supporting said wheel, operating mechanism for driving said drive means, said operating mechanism including means for rotating said wheel faster than its driven speed upon release of a bowling ball engaged by said wheel whereby said released bowling ball is accelerated toward the head end of said alley, stop means mounted on said wheel limiting the over rotation of said wheel, and means normally urging said rotatable wheel into operative position relative to said track.

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