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BOWLING BALL ACCELERATOR MECHANISM

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5 Claims

ABSTRACT OF THE DISCLOSURE

A bowling ball accelerator for use on automatic pin setting machines which have a ball return track. The accelerator mechanism includes a movable mounting frame rotatably supporting an accelerator wheel which has a resilient frictional ball engaging surface. The wheel is disposed for contact with bowling balls moving along the ball return track, and the track itself is provided with resilient covers or sleeves at the zone for accelerator wheel contact to obtain improved ball rotational speeds. An adjusting means for changing the wheel to ball contact pressure provides elements for holding the mounting frame and wheel in inoperative position.

The present invention relates to a bowling ball accelerator and, specifically, to such an accelerator for use in connection with existing types of automatic bowling pin setting machines. In general the present mechanism is intended for use with bowling machines of the type mentioned in my copending Patent No. 3,319,959 Issued May 16, 1967, which is directed to a Pin Cushion Mount and Actuator Mechanism, for such bowling machines.

A primary objective of the present invention is to provide a mechanism which will efficiently engage a bowling ball to accelerate the return travel speed of such ball.

A further object of the invention is to provide improved ball engaging and acceleration characteristics for a wheel type ball accelerator.

In connection with the foregoing object, it is a further object to provide supplementary ball engaging means which will increase the efficiency of contact between a ball accelerator wheel and a bowling ball.

Another object of the invention is to provide a bowling ball accelerator which may be applied to ball guide tracks having both vertical and horizontal guide curves adjacent the accelerator station.

Another object of the invention is to provide a ball accelerator having improved contact characteristics between the accelerator wheel and ball and between the ball and guide rails whereby a more efficient transfer of the forces of acceleration is obtained to closely regulate the increased speed of the ball.

A specific object of the invention is to provide yielding surfaces on an accelerator ball wheel and on adjacent ball guides to obtain improved contact whereby the rotational energy of said wheel is efficiently converted to increased velocity for the bowling ball.

A further object of the invention is to provide a bowling ball accelerator which may be positioned conveniently in existing types of bowling pin setting machines without undue modification of installed components.

A further object of the invention is to provide novel adjusting means which further facilitate the installation and removal of existing ball dusters.

An overall objective is to provide a ball accelerator which can be economically installed on existing bowling machines without substantial modification of such machines so that the return speed of the bowling ball can be increased to effectively reduce the waiting time between successive rolls of the ball.

A further overall objective is to provide a ball accelerator which may be used in conjunction with the pit cushion mechanism described in my mentioned copending application to cooperatively further reduce the time lapse interval between successive ball rolls.

Further objects and advantages of the present invention will be apparent from the appended description and drawings, in which

FIG. 1 is a top view illustrating components of a preferred embodiment of the invention,

FIG. 2 is a side elevation of the mechanism shown in FIG. 1, with ball duster components being added,

FIG. 3 is a rear elevation showing further features of the invention,

FIG. 4 is a partial rear cross-sectional elevation taken through the accelerator wheel and accelerator wheel drive mechanism, and

FIG. 5 is a rear elevation similar to FIG. 3 with the ball wheel in elevated position.

Briefly stated, the present invention provides a wheel type accelerator for use in bowling operations which is designed so that the accelerator wheel may be positioned above a return track for the bowling ball. The vertical positioning of the accelerator wheel itself is adjustable so that the force of contact between the wheel and the ball may be adjusted and, further, so that the entire mechanism and support thereof may be moved to an out of way position to facilitate the removal of a ball duster unit normally provided on bowling machines of such type. The accelerator wheel is of a pneumatic or semi-pneumatic type, and the exterior surface of the wheel is provided with a cover of low durometer to minimize marking of the ball while increasing the frictional contact characteristics for the wheel. The invention further provides means for increasing the inertia of the wheel. A further important improvement is involved in the provision of resilient covers for the ball guide track in the area adjacent the accelerator wheel so that any tendencies for the ball to slide away from the accelerator rather than roll at increased speed will be minimized.

The detailed features of construction and operation which contribute to such improved result are shown in the accompanying figures. In FIGURES 1 through 3 it will be seen that the ball accelerator is designated as a unit by the numeral 11. Such unit includes a base support 12 upon which the drive motor 13 and an accelerator wheel mounting arbor 14 are secured. The arbor assembly 14 includes self-aligning bearings 16 and 17 and the accelerator shaft 18. The base 12 is itself pivotally mounted on a frame 21 by means of the pivot bolt 22. The frame 21 is attached to supports of the bowling pin setting mechanism and is actually in part a portion of the original support frame for a walkway. A substitute walkway is provided by the board 23 which is shown in its new and elevated position as likewise supported by the frame 21. For convenience of illustration, the walk board 23 has been removed in the FIGURE 1 presentation.

In operation of the bowling machine, the ball progresses from one or the other of the curved entrance
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Guide tracks 24 and moves toward the left past the ac
celerator position and thence down a vertically inclined 
cross bar 28 on the forward portion of the frame 21 which supports a centrally disposed adjusting link 29 and a pair of laterally disposed limit bolts 31. The limit bolts 31 extend loosely through openings in the base 12 so that the base may be moved up and down along the support bolts. The lower head 32 of such bolts 31, however, pro
gresses a limit or stop so that the accelerator mechanism 11 cannot be lowered to a position which would block the passage of a bowling ball unless the bolts 31 are removed from the cross bar 28. The base 12 of the ac
celerator 11 may be raised, however, to an upper limit position where the base or the extension tongs 33 on such base interfere with the cross bar 28 or the cen
trally disposed adjusting link 29.

In order to obtain a better contacting relationship be
tween the ball and guide track so that the ball will be

Since the rotative speed of the accelerator wheel as
sembly 50 is of considerable importance in the attain-
ment of the desired ball acceleration, it is thought best to de
scribe the size ratios of an efficiently working as-
ssembly. In such a desired embodiment an electric drive 
motor 13, rotating at 1720 rpm, propels a drive pulley 42 hav
having an operational pitch diameter of 2.1 inches. This drive pulley is connected to a driven pulley 44 hav
having an operational pitch diameter of 8.0 inches. The outer diameter of the wheel 48 is approximately 8.5 or 9.5 inches, with contact face 49 installed. These ratios provide a drive assembly rotating at approximately 450 rpm, 
and, accordingly, the accelerator wheel has a peripheral speed of 16.5 feet per second. With this arrangement a 
ball which normally travels at an overall speed of ap
proximately 5 miles per hour without requiring undue 
modification of the guide track or of the retarder mech
anisms at the head of the bowling alley.

In existing installations the listed acceleration is a 
practical operating maximum, since any increase there
above creates a tendency for the ball 41 to leave the guide 
track 25 at the vertical curve 26. Since the maximum sav
ing of elapsed time for the ball passage can only be realized when the maximum satisfaction acceleration is attained and since only a slight increase therefore will cause operative and maintenance difficulties, it is necessary that the acceleration imparted to the ball be closely controllable. The adjustment mechanisms described facilitate such close control, but it has been found that the provision of standard frictional contact characteristics between the ac
celerator wheel and the ball and the guide track are of equal importance.

In order to obtain a better contacting relationship be
between the ball and guide track so that the ball will be
given an increased rotative speed rather than a lateral sliding or ejection component, the present embodiment of the invention provides for the installation of resilient covers 56 on the guide track 25 at the zone where the ball is being accelerated. In a satisfactory installation, pieces of transparent vinyl tubing having tapered entrance and exit edges 57 have been applied to the guide track 25. When the ball is positioned above these resilient vinyl covers 56 and when the ball is contacted by the accelerator wheel 50, the covers 56 are deformed so that good frictional contact is established between the ball and the guide rails. This lower frictional contact prevents the ball from slipping or sliding away from the accelerator wheel, and instead a top spin is imparted to the ball which not only accelerates the ball but has a tendency to keep the ball in contact with the descending curve 26, which is quite closely adjacent the accelerator position. The effectiveness of such resilient covers 56 is in the described installations quite easily demonstrated, since upon removal of the flexible covers a lesser acceleration will be obtained, and the balls will have a tendency to jump off the guide track.

The described invention has further advantages that are inherent in this improved design. The fact that the wheel 50 is of small diameter makes it possible for the accelerator 11 to be positioned on existing machines without excessive modification. That a small wheel can be used and that the wheel can be rotated at a speed of less than one third the speed of the drive motor is likewise of importance from the standpoint of economy of operation and maintenance. At such low rotative speeds the bearings, wheels and all comparable assemblies can be expected to last through an extended service life. It has further been found that the ball acceleration obtained through use of this mechanism is adequate for the expected life of the installation. Since a line of bowling may be accomplished in less total elapsed time, the bowling alley proprietor can expect an increased revenue through use of this mechanism.

When such mechanism is used together with the pin cushion mount described in my co-pending application, an overall time reduction is obtained, which likewise economically justifies joint installation of such conversion mechanisms. The fact that such increased speed of operation can be obtained without necessitating extensive modification of the basic automatic pin spotting machine or of the return or reserve mechanism at the head end of the lanes makes a combined installation highly desirable and less costly than alternate types of modifications for similar cycle speeding purposes. The mechanism installed in accordance with the present disclosure will not interfere with any of the regular operations of the presently installed pin spotting machines to which this mechanism is adaptable. As shown in FIGURES 2 and 5 the accelerator wheel 50 and its associated drive components can be raised to an out of way position so that the ball duster 53 may be removed from its support assembly. When the accelerator mechanism is raised as shown in FIGURE 5, the duster 53 with associated hoops 58 may be slid reciprocally out of its normal position in the support assembly 54 so that the ball duster may be completely removed. When the cloths have been cleaned or when new cloths have been applied, the ball duster may be reinserted in the support assembly 54 and the accelerator mechanism can be lowered to its previously adjusted position against the stop nut 38.

While separate embodiments of the invention have been shown and described, it should be apparent that the mechanism is adaptable to various modifications and changes. All such changes as are embodied within the terms of the appended claims are considered to be a part of the invention.

I claim:

1. A bowling ball accelerator mechanism for use on automatic pin spotting machines to speed the return of bowling balls along a guide path comprising a support frame, ball guide surfaces on said frame, an accelerator frame movably carried by said support frame, a drive motor mounted on said accelerator frame, accelerator wheel means rotatably supported on said accelerator frame and having a resilient, frictional, ball engaging peripheral surface, drive means interconnecting said motor and accelerator wheel for rotating said wheel, adjusting means carried by said support frame for allowing said accelerator frame to move vertically relative to said support frame and guide surfaces to change the contact pressure exerted by the resilient surface of said accelerator wheel against bowling balls moving along said ball guide surfaces, and elements providing resilience for said ball guide surfaces at a zone extending through the full zone of contact for said accelerator wheel and balls for minimizing sliding contact between said ball and ball guide surfaces due to the accelerating impact of said wheel whereby an increased rolling speed is imparted to said balls.

2. A bowling ball accelerator mechanism for use on automatic pin spotting machines to speed the return of bowling balls along a guide path comprising a support frame, ball guide surfaces on said frame, said guide surfaces being inclusive of a downwardly curved ball accelerating component, an accelerator frame movably carried by said support frame, a drive motor mounted on said accelerator frame, accelerator wheel means rotatably supported on said accelerator frame and having a resilient, frictional, ball engaging peripheral surface, said accelerator wheel being positioned ahead of said downwardly curved ball accelerating component, drive means interconnecting said motor and accelerator wheel for rotating said wheel, adjusting means carried by said support frame for allowing said accelerator frame to move vertically relative to said support frame and guide surfaces to change the contact pressure exerted by the resilient surface of said accelerator wheel against bowling balls moving along said ball guide surfaces, and elements providing resilience for said ball guide surfaces at a zone extending through the full zone of contact for said accelerator wheel and balls for minimizing sliding contact between said ball and ball guide surfaces due to the accelerating impact of said wheel whereby an increased rolling speed is imparted to said balls for improved contact between the balls and the ball guide surfaces inclusive of said downwardly curved ball accelerating component.

3. Structure as set forth in claim 2 wherein said ball guide surfaces are separate spaced apart rails and wherein the resilient elements for said ball guide surfaces comprise individual covers of resilient materials disposed on each of said rails.

4. A bowling ball accelerator mechanism for use on automatic pin spotting machines to speed the return of bowling balls along a guide path comprising a support frame, ball guide surfaces on said frame, an accelerator frame movably carried by said support frame, a drive motor mounted on said accelerator frame, accelerator wheel means rotatably supported on said accelerator frame and having a resilient, frictional, ball engaging peripheral surface, drive means interconnecting said motor and accelerator wheel for rotating said wheel, adjusting means carried by said support frame for allowing said accelerator frame to move vertically relative to said support frame and guide surfaces to change the contact pressure exerted by the resilient surface of said accelerator wheel against bowling balls moving along said ball guide surfaces, elements on said accelerator frame readily engageable and disengageable with said adjusting means, and retaining means carried by said adjusting means for selective engagement by said elements for holding said accelerator frame vertically upward in an inoperative position.

5. Structure as set forth in claim 4 and further comprising elements providing resilience for said ball guide surfaces at a zone extending through the full zone of contact for said accelerator wheel and balls for minimizing
sliding contact between said ball and ball guide surfaces due to the accelerating impact of said wheel whereby an increased rolling speed is imparted to said balls.

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