BOWLING ALLEY BACKSTOP MECHANISM

Gustaf E. Hagquist, Brooklyn, N. Y., assignor to American Machine and Foundry Company, a corporation of New Jersey

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This invention relates to bowling pin setting machines, and more particularly to improvements in mechanism for stopping the movement of balls in the pit and preventing rebound of the ball and pins which results in illegal pin fall. The improved backstop which forms a part of this invention may be used on any alley.

Backstops or bumpers or so-called swinging curtains currently used in bowling alleys generally consists of a heavy, upholstered leather, springs and hair combination in which the covering, such as leather, encloses the hair and springs, and extends forwardly and outwardly into the pit.

When this type of bumper is new, it may satisfy American Bowling Congress rules, but require that no part thereof be less than thirty inches from the end of the bowling alley at the front of the pit. However, due to impact of balls in continued use, the padded surface thereof becomes worn and is knocked out of shape so that the center portions drop downwardly toward the pin and become misshapen in that the stuffing is gradually forced or sags toward the lower part of the bumper. Such a bumper, therefore, no longer conforms to American Bowling Congress rules inasmuch as parts thereof, especially parts near the pin, are much closer than thirty inches, the limit specified by the American Bowling Congress.

Under such conditions, some balls, especially rapidly thrown balls, upon striking against a misshapen part of the bumper are apt to be thrown back onto the playing surface of the alley where pins are knocked down and illegal pin fall results.

The present invention aims at removing the above noted unsatisfactory conditions and at the same time fills the need of a more practical type of backstop, especially a type of backstop desired for use in connection with an automatic bowling pin setting machine.

Applicant has found that if a relatively thin backstop be employed in connection with a flexible ball lifting apron which is draped substantially vertically downwardly over the face of the backstop into the pit, the shock of balls arriving in the pit and striking the backstop is completely assimilated and rebound of the ball onto the pin supporting surface of a bowling alley is likewise substantially eliminated. At the same time a longer life results both from the point of view of the backstop and the apron which acts therewith and also forms the means for lifting pins from the alley in the course of play with the bowling machine of which the mechanism constituting the invention is a part.

The backstop alone forms an important part of the invention because at all times, both when new and after long and continued play, it meets the requirements of the American Bowling Congress with respect to the set distance between the face of the backstop and the end of the alley with which it is used.

Applicant's novel backstop-ball lifting apron combination, substantially no jams or clogging can occur between the head of a pin and balls on the ball lift cradle which is preferably used in connection with the improved backstop and apron because of the fact that at all times there is a substantially straight line motion upwardly along the face of the backstop with respect to the ball and/or pins which may be carried by the cradle. In the case where an overstuffed padded backstop of the type described above is used in connection with a flexible pin lifting apron such as described when the bumper becomes distorted in shape there is a tendency for the ball and/or pins which might be carried by the ball lift cradle to become lodged between the underside of the face of the bumper adjacent the pit and the ball lift cradle. Since the average weight of an overstuffed bumper is approximately 300 pounds it can be seen that the strain and stress put upon the ball lift mechanism is considerable if a pin or ball is so jammed, and the machine may be stalled or breakage of parts result.

If the old type heavy padded curved faced bumper is used, a pin might be forced backwardly by a ball and form a bight in the apron so as to cause excess pressure to be exerted by the rear bar of the ball lifting cradle urging the pin upwardly against the bumper thereby resulting in breakage.

According to the present invention any pin lifted with a ball on the cradle will either be pushed off the cradle and into the pit apron by the action of the vertical face of the bumper relative to the cradle, or if a pin is so carried to the uppermost discharging position, it will be discharged normally without jamming against the bumper. Furthermore, once a ball is located properly on the ball lift cradle and although a pin may also be lifted by the cradle, no jam can occur because of the movement of the cradle relative to the unplanned face of the bumper.

It is obvious, therefore, that the present structure eliminates this danger of part breakage. My invention, therefore, consists in the provision
of a novel ball backstop or bumper for use in bowling alleys or with bowling machines in which wear and tear is greatly reduced and rules of the American Bowling Congress are met at all times despite long use of the same bumper.

My invention also consists in the provision of a bowling pin setting machine having an improved bumper and a flexible ball lifting apron associated therewith which absorb the shock impact of a bowling ball arriving in the pit of a bowling alley with a minimum of wear and tear on the bumper and apron, decrease the rebound of the ball, and make it easier to provide for wear by replacement of the apron.

My invention is further characterized by the provision of a ball pit backstop construction consisting of a relatively thin resiliently mounted backstop mounted at the rear of the pit of a bowling alley in substantially a vertical plane, and which is provided with a relatively resilient uniplanar ball impact receiving face which is substantially unaffected by long usage and wear.

In the accompanying drawings which illustrate a preferred embodiment of the invention and 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, partly in section disclosing the invention;

Figure 2 is a front elevation with parts broken away to show the construction of a preferred form of backstop and its association with the pin lifting mechanism; and

Figure 3 is an isometric view showing the association and coaction between the backstop and ball and pin lifting mechanisms.

The mechanism selected for purposes of illustrating the preferred form of the invention may be used in an automatic bowling pin setting machine of the same general construction and operation as that shown and described in Rundell patent, No. 2,388,707, issued November 13, 1945.

While the back stop which forms a part of this invention may be used on any alley independently of a machine since it provides a bumper or means for stopping a ball in the pit of an alley and preventing its rebound onto the playing surface thereof, it finds a special application in a machine of the type above referred to.

Referring to Figures 1 and 2, the machine is provided with side frames 20 secured to the tops of kick backs 22 located at the sides of the pit of bowling alley A. The machine is provided with a pin conveyor 24 which conveys pins from chamber C upwardly to pin distributing mechanism (not shown) operative in proper timed relation to deliver pins to a storage magazine (not shown). Since this mechanism forms no part of the present invention, further description and disclosure are deemed unnecessary in the interest of brevity. Conveyor 24 is driven in proper timed relation by shaft 26 through clutch 28 from a suitable source of power (not shown).

As illustrated in Figure 1, a pin elevating mechanism designated generally 30, which in the preferred embodiment consists of a flexible apron or belt 31 formed of heavy canvas, or a canvas-rubber combination or other suitable material is adapted to fall and pins from the pit P of the alley upwardly for discharge between transversely inclined ball delivery guides 32, 34 downwardly into chamber C. Guides 32, 34 extend transversely the full width of the machine and are so inclined that a ball deposited thereon will roll by gravity and be positively moved there-
brackets 104 and pins 106 mounted on the rear face of the frame 65. These springs urge the backstop into the desired vertical position against limit stops 108 on brackets 104 secured to kick backs 22. The tension of the springs is such that the back stop may yield backward whenever a ball strikes against apron 30 and the back stop after which it is immediately returned to the position shown in Figure 1.

The front part of frame 65 is provided with a recess 63 in which is fitted and secured a relatively thin, wide, shock absorbing mat which constitutes the ball impact receiving portion of the backstop. Any suitable material may be used for this part of the backstop. It has been found that a mat 67, made up of a series of strips cut from rubber tires and secured together by means of wire, as illustrated in Figure 2, is very satisfactory for this purpose. The width of the rubber strips may range from one-half inch to two inches, more or less, as desired. This mat may be attached to frame 65 by any suitable means, such as clamps 68.

A readily obtainable material suitable for use as the mat portion of the novel backstop consists of rubberized tire fabric strips cut from sidewalls and treads of six and eight ply discarded automobile tires. The strips can range from one-half to two inches in width, depending on the thickness of mat required. The strips, all of one selected width, are punched with a series of holes and assembled, as is shown in Figure 2, and held in mat form by wires 61.

The mat 67 may, if desired, cover the entire front of frame 65. In the back stop disclosed, mat 67 is approximately one inch thick, approximately two feet high, and substantially pit wide. The height can be varied, although it is so designed and positioned in frame 65 that any type of ball, hard thrown or otherwise, will strike against the mat portion. Recess 63 is so formed that the front face of mat 67 preferably is flush with the front face of frame 65. The total thickness of the back stop illustrated is approximately two and one-half inches. This dimension can, however, be varied between one and one-half and four inches.

In operation a ball rolling into pit P falls on platform 62 pivotally attached at 110 to blocks 112 secured to the front of the pit P. A spring 114 which supports the free end of platform 62 is thereupon compressed and switch 120 is closed thereby making a circuit through wires 122, 124 which energizes solenoid 125 mounted on frame 20. Armature 126 connected to lever 130 pivotally supported on bracket 132 on frame 20 swings the nose 134 of lever 130 out of engagement with clutch operating member 138 and clutch 138 is thrown in thereby coupling driving sprocket 142 secured to continuously rotating shaft 144 to gear 146. Sprocket 142 is formed with a sleeve 141 extending through and normally loosely supporting gear 146. Shaft 144 is preferably driven continuously by means of sprocket 142 and chain 148 running on a continuously rotating driving sprocket (not shown) driven by any suitable driving means.

When gear 146 is set into rotation by being coupled with sleeve 141, gear 150 which meshed there with is driven thereby rotating cam shaft 152 to which is fastened a cam 154 provided with cam tracks 156 and 158. Running in track 156 is a cam follower 155 pivotally mounted on lever 152 fulcrum on shaft 164 supported by the side frames of the machine 20.

A rod 166 attached to the free end of lever 162 is provided with a rack 168 which meshes with a pinion 170 fastened to shaft 170 which supports pulleys 28, 30, and 26, 27. Rack 168 is maintained in driving engagement with pinion 170 by means of a flanged roller 172 rotatably supported in bracket 174 on shaft 170.

Running in cam track 158 is a follower 176 pivotally mounted on lever 178 also fulcrummed on shaft 180. A rod 182 pivot to the free end of lever 178 is provided with a rack 181 meshing with and driving pinion 182 fastened to shaft 184 which supports pulleys 48. Rack 181 is maintained in proper driving relationship with pinion 182 by means of a flanged roller 188 rotatably supported by bracket 186 on shaft 182. It will be evident from the foregoing that whenever shaft 152 is set into rotation in the manner described, by means of cam 154 and cam tracks 156 and 158, ball lift 174 and apron 30 will be operated in such sequence that a ball is first lifted from the pit P and discharged on the transfer delivery guides 32, 34 and the ball lift then assumes the position shown in dotted lines in Figure 1.

Following the operation of the ball lift, one end of the apron 30 is lifted as slide 38 moves upwardly in guides 40 and the other end of the apron is rolled on roller 66 until a portion of the apron 30 assumes the position indicated in dotted lines in Figure 1 wherein the pins are discharged between guides 32, 34 into chamber C. Continued rotation of shaft 152 results in the return movement of apron 30 and ball lift 74 to the positions indicated in Figure 1 in which portion 31 of apron 30 is draped substantially vertically in front of the mat portion 61 of back stop 64. As described heretofore, this relationship between the backstop and apron 30 makes it possible to insure that the distance from the face of the backstop to the edge of the playing surface of the alley will always be within the specifications set by the American Bowling Congress regardless of the amount of wear and usage of the backstop and apron. Furthermore, due to the substantially unchanging face of the bumper, over long usage, wear and tear on the apron 30 is maintained at a minimum and at the same time balls and pins are lifted by the apron 30 and ball lift 74 substantially vertically relative to the planar front face of backstop 64 with substantially complete elimination of breakage of parts due to the novel connection between these members and the back stop of the invention.

The invention above described may be varied in construction within the scope of the claims, for the particular device, selected to illustrate the invention, is but one of many possible concrete embodiments of the same. It is not, therefore, to be restricted to the precise details of the structure shown and described.

What I claim is:
1. In a bowling pin setting machine in combination a relatively thin backstop provided with a substantially vertical uniplanar ball striking surface, means mounting said backstop at the rear of the pit of a bowling alley, a flexible pin lifting apron for lifting pins out of said pit, means mounting one end of said apron above said backstop, said apron being held by said means in draped relationship over and extending downwardly in front of said backstop and longitudinally of said pit to a point adjacent the end of said alley, a ball lift located in front of said backstop and adjacent thereto and arranged to rest upon said apron, and means for raising said
ball lift and said apron free of interference by said backstop to discharge balls and pins from said ball lift and apron.

2. In a bowling pin setting machine adapted to be located adjacent the pit of a bowling alley, a relatively thin backstop provided with a substantially uniplanar ball engaging face, means mounting said backstop in a substantially vertical plane at the rear of said pit, means urging the lower portion of said backstop towards the front end of said pit, stops limiting the forward movement of said backstop, a substantially pit wide flexible apron draped over and extending downwardly in front of and substantially in contact with said uniplanar face of said backstop and longitudinally in said pit and adapted to contain pins and a ball falling into said pit and onto said apron, means for supporting said draped portion of said apron substantially in contact with said uniplanar face of said backstop in substantial parallelism with said face of said backstop, and means for raising said apron and any pins and a ball contained therein relative to and in front of said backstop free from interference between pins carried by said apron and said backstop.

GUSTAF E. HAGQUIST.

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