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 SPRING POWERED BOWLING BALL PROJECTOR WITH
 ADJUSTABLE CAM CONTROLLED RELEASE
 Filed Jan. 11, 1963

3,142,292

Fig. 1.

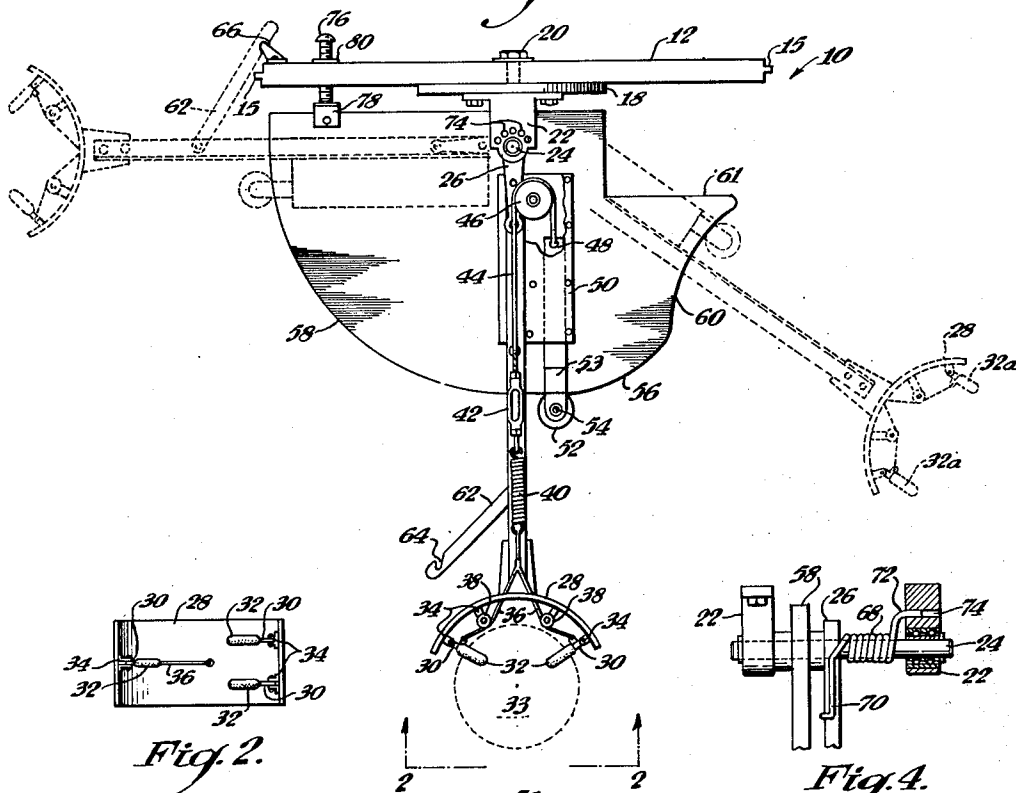


Fig. 2.

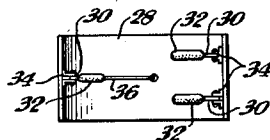


Fig. 4.

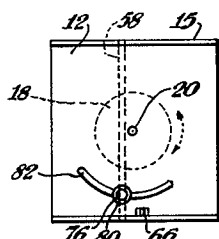
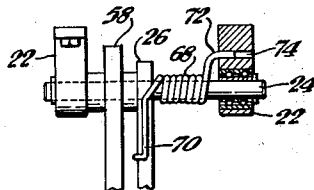


Fig. 5.

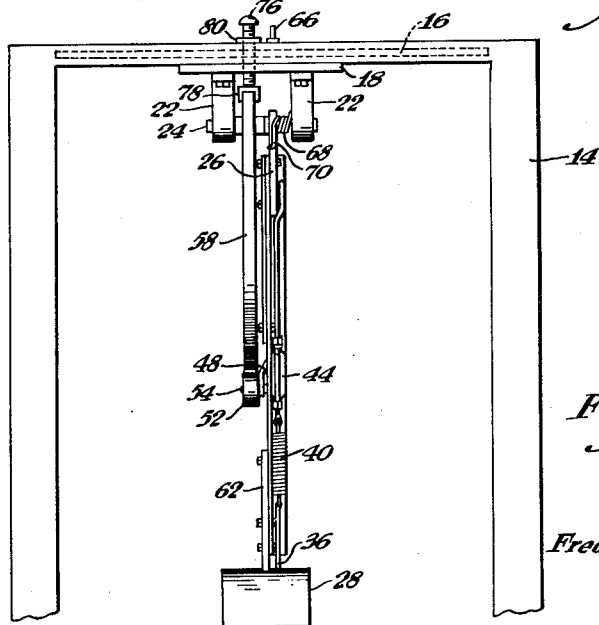


Fig. 3.

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3,142,292 SPRING POWERED BOWLING BALL PROJEC- TOR WITH ADJUSTABLE CAM CONTROLLED RELEASE

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This invention relates to bowling apparatus and, more particularly, to a bowling ball hurling device.

It is an object of the present invention to provide a mechanical device for simulating the manual delivery of a bowling ball.

Another object of the present invention is to provide apparatus for mechanically hurling a bowling ball which may be installed along the foul line of a bowling lane, which may be adjusted laterally of the bowling lane and angularly with respect thereto to effect the delivery of a bowling ball along any desired path toward the opposite end thereof.

An additional object of the present invention is to provide apparatus for mechanically delivering a bowling ball of the type described which has means for adjusting the loft of the ball and the force with which it is launched.

All of the foregoing and still further objects and advantages of this invention will become apparent from a study of the following specification, taken in connection with the accompanying drawing, wherein:

FIGURE 1 is a side elevational view of the main operating components of apparatus for mechanically hurling a bowling ball in accordance with the present invention;

FIGURE 2 is a bottom plan view of the bowling ball engaging fingers forming a part of the present invention, taken along line 2-2 of FIGURE 1;

FIGURE 3 is a rear elevational view of the apparatus shown in FIGURE 1 mounted upon a support frame which is placed in straddling position upon a bowling lane in alignment with the foul line thereof;

FIGURE 4 is an enlarged fragmentary rear view, with parts broken away and partly in section, of the main supporting shaft assembly of the present invention; and

FIGURE 5 is a top plan view, on reduced scale, of the apparatus shown in FIGURE 1.

Referring now to the drawing, apparatus 10 for mechanically hurling the bowling ball in accordance with the present invention, shown to include a main plate 12 for mounting upon a support frame 14 that is in alignment with the foul line in straddling arrangement with the bowling lane. The support frame 14 may be mounted upon any suitable base for supporting the unit along the foul line of the bowling lane. The upper portion of the support frame 14 is provided with a pair of channels 16 which slidably receive slides 15 at the forward and rear extremities of the main plate 12, whereby the main plate 12 can be adjusted along the length of the channels 16 to adjustably position the main plate 12 laterally with respect to the bowling lane.

A bearing plate 18 is rotatably mounted, by means of a bearing pin 20, beneath a central portion of the main plate 12. This bearing plate 18 has mounted upon its under surface, a pair of bearing supports 22 which rotatably support a shaft 24, upon which an arm 26 is supported.

The opposite end of the arm 26 includes an arcuate plate 28, within which a set of three levers 30 are pivotally mounted upon hinge elements 34, spaced apart to correspond with the spacing of the three holes in a conventional bowling ball 33. The levers 30 are preferably covered with rubber sheaths 32 to simulate fingers for insertion into the openings of the bowling ball 33. Each of the rubber finger covered levers 30 is connected to a

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cable 36, the intermediate portions thereof being trained about the guide pulleys 38, as clearly shown in FIGURE 1. This cable 36 extends through the plate 28 and is connected to a tension spring 40 which has a turnbuckle 42 that is connected to an extension 44 of the cable that is further trained about a guide pulley 46 mounted upon an upper portion of the arm 26, and connected at its opposite end to a follower bar 48.

The follower bar 48 is slidably supported within a housing 50 carried by the arm 26 for reciprocating longitudinal movement. The outer end of the follower bar 48 rotatably supports a follower roller 52 upon an offset portion 53 that supports a shaft bearing 54. The follower roller 52 is maintained in engagement with the cam surface of a cam plate 58 vertically mounted upon the shaft 24 within a plane that is in juxtaposition with the plane of movement of the arm 26.

The cam plate 58 has a main cam segment 56 which constitutes the arc of a circle having its center of curvature coincident with the longitudinal axis of the shaft 24, and a terminal cam surface 60 which has a radius of curvature substantially shorter than the radius of curvature of the main cam segment 56. The arm 26 is thus arranged to move through an arc of approximately 135° between its initial elevated horizontal position and its released position, as shown in broken lines in FIGURE 1, at which point the follower roller 52 will engage with the terminal cam surface 60 to allow radially inward movement of the cam bar 48 to effect movement of the finger levers 30 from their retracted ball engaged position to their spread apart ball released position 32a, to allow release of the ball from the mechanism. Throughout the movement of the arm 26 from its initial elevated horizontal position, until the cam roller 52 engages the terminal cam surface 60, the follower roller 52 engages the main cam surface 56 which is concentric with the path of rotation of the arm 26, whereby the fingers 32 are maintained in grasping retracted engagement with the bowling ball 33. The cam plate 58 is also provided with a flat 61, onto which the cam roller 52 may be received, to retain the arm 26 in a final resting position with the fingers in the spread position, for mounting the next ball to be launched thereupon, prior to returning the arm to its initial elevated horizontal position for the next launching. By installing the ball with the arm and follower roller 52 engaged with the flat 61, the ball need be held only until the cam roller 52 passes through the terminal cam surface 60 and on to the main cam surface 56, at which time the fingers 32 are retracted to grasp the ball and prevent its release.

The arm 26 may be supported in its initial elevated horizontal position by means of a latch bar 62 having an indent 64 for receiving a latch element 66 carried by the main plate 12. Thus, this mechanism will retain the arm in the elevated position until the bar 22 is disengaged from the element 66 to allow the arm to move downwardly by gravity, and under the pre-loaded action of a torsion spring 68 mounted upon the shaft 24. As is more clearly shown in FIGURE 4, the torsion spring 68 has one terminal portion 70 engaging behind the arm 26, with the opposite end of the spring having a right angle bend 72 which is receivable within any one of a plurality of arcuately spaced openings 74 in the adjacent shaft support bearing 22. Thus, the extent of initial spring pressure upon the arm 26 may be varied by inserting the terminal 72 of the spring in any one of the openings 74.

A threaded shaft 76 is threadedly carried by an enlarged plate 80 overlying the top of the main plate 22. The shaft 76 extends through an arcuate slot 82 in the main plate 12, the arcuate slot 82 having a radius of curvature coincident with the pivot bearing pin 20. The

lower end of the shaft 76 is rotatably secured to a bracket 78 pivotally mounted upon the adjacent portion of the cam plate 58. Thus, by rotating the shaft 76, the cam plate 58 may be adjustably rotated, within certain limits, about the supporting shaft 24, so as to adjust the orientation of the terminal cam surface 60 relative to the path of movement of the arm 26. Since the point of release of the ball along the arcuate path of movement of the arm will control the "loft," the shaft 76 provides means for adjusting the cam 58 to similarly control the point of release of the ball to thus control the loft of the ball. As such, a lowering of the shaft 76 will effect a corresponding elevation of the terminal cam surface 60, to provide increased loft of the ball. The arcuate slot 82 thus allows for the connection of the shaft 76 between the main plate 12 and the cam plate 58, without interfering with the rotational movement of the bearing plate 18 and its supported parts about the vertical bearing support pin 20.

It will now be recognized that this apparatus substantially duplicates the movement of the human arm and muscles as used during the launching of a bowling ball. It will also be recognized that the arm 26 may be spring loaded about its longitudinal axis, to impart a twist or spin to the ball at the time that it is released, in much the same manner that a twist of the wrist will impart a similar spin to the ball during conventional bowling.

While this invention has been described with particular reference to the construction shown in the drawing, it is to be understood that such is not to be construed as imparting limitations upon the invention, which is best defined by the claims appended hereto.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. Apparatus for mechanically hurling a bowling ball comprising, in combination, a support for straddling a bowling lane in alignment with the foul line thereof, a main plate horizontally slidably supported upon said support for adjustment laterally of the bowling lane, a bearing plate rotatably supported upon said main plate for rotational adjustment about a vertical axis, a horizontal shaft rotatably carried by said bearing plate, an arm pivotally mounted at one end upon said shaft, a set of bowling ball engaging fingers pivotally carried by the opposite end of said arm for pivotal movement relative to each other between a retracted ball engaged position

and a spread ball released position, a cam plate with a cam surface carried by said shaft, a follower carried by said arm engaged with said cam surface, mechanical motion transmitting means connected between said fingers and said follower, and said cam surface having a main segment retaining said fingers in said retracted position throughout the initial stage of arcuate movement of said arm from an elevated position, and a terminal segment permitting movement of said follower to effect movement of said fingers to said spread position during the final stage of arcuate movement of said arm.

2. Apparatus for mechanically hurling a bowling ball as set forth in claim 1, further comprising a releasable latch acting between said main plate and said arm for releasably retaining said arm in an initial horizontal position.

3. Apparatus for mechanically hurling a bowling ball as set forth in claim 2, further comprising a torsion spring carried by said shaft and acting between said bearing plate and said arm and spring loading said arm in said initial elevated position adjacent said main segment of said cam surface.

4. Apparatus for mechanically hurling a bowling ball as set forth in claim 3, wherein said cam plate is rotatably carried by said shaft for limited rotation in a vertical plane, and angular adjustment means acting between said cam plate and said main plate for angularly adjusting the position of said terminal segment of said cam surface relative to a vertical reference line extending through said cam plate.

5. Apparatus for mechanically hurling a bowling ball as set forth in claim 4, wherein said mechanical motion transmitting means comprises a cable connected to said fingers and said follower, a pulley carried by said arm between said shaft and said follower, said cable being trained about said pulley, and a spring connected intermediate the ends of said cable cushioning the movement of said fingers between said engaged and released positions.

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