Oct. 31, 1967 L. J. STAN 3,349,647

BOWLING BALL DRILLING METHOD AND APPARATUS

Filed Aug. 31, 1965

3 Sheets-Sheet 1

FIG. 1.

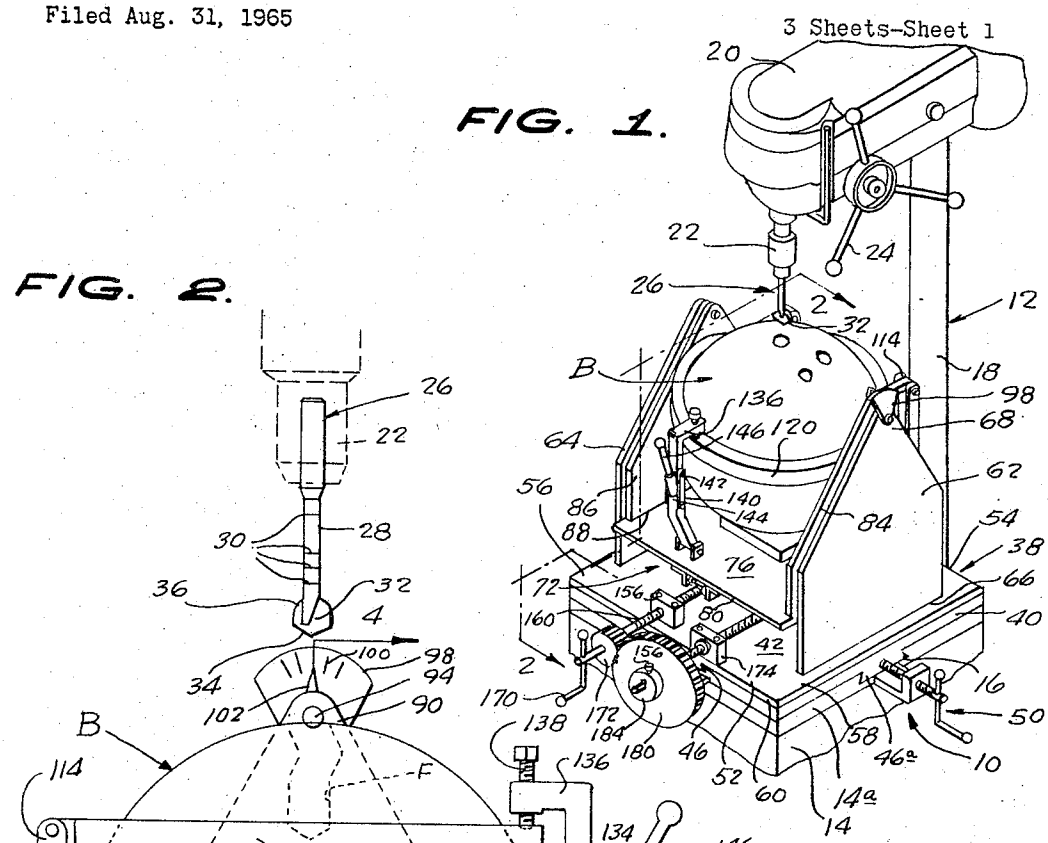


FIG. 2.

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Filed Aug. 31, 1965 3 Sheets-Sheet 2

FIG. 3.

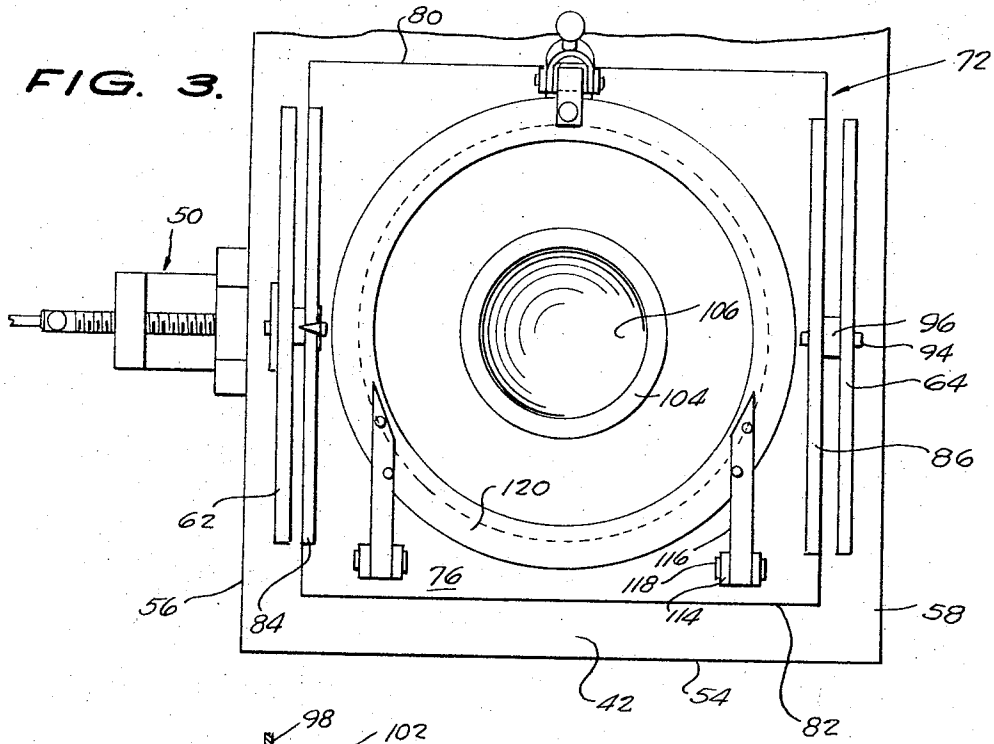
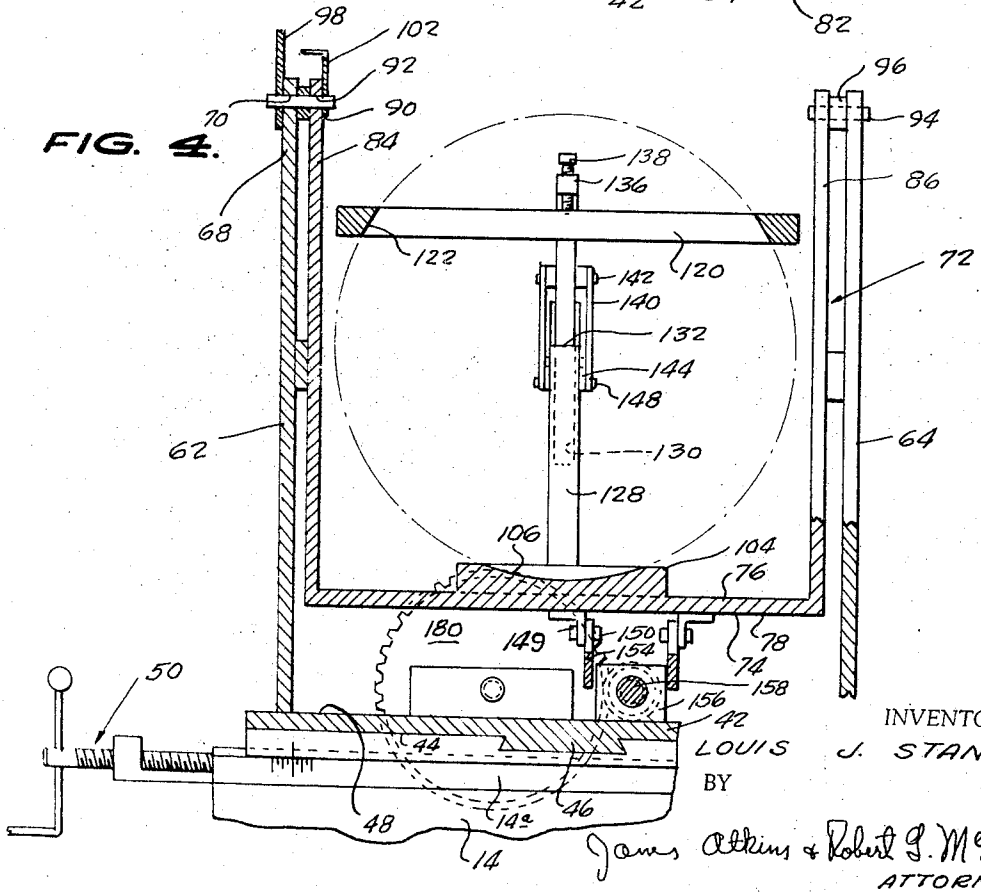


FIG. 4.



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Filed Aug. 31, 1965 3 Sheets-Sheet 3

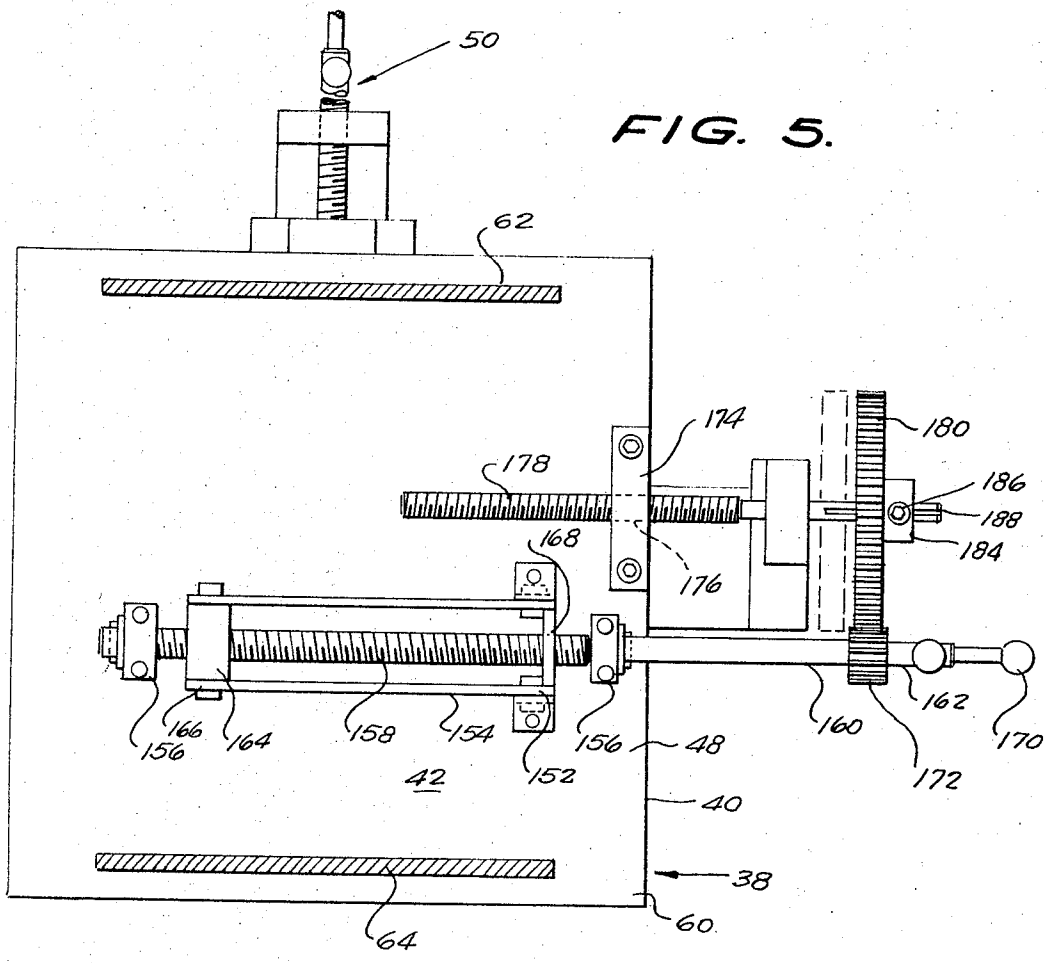


FIG. 5.

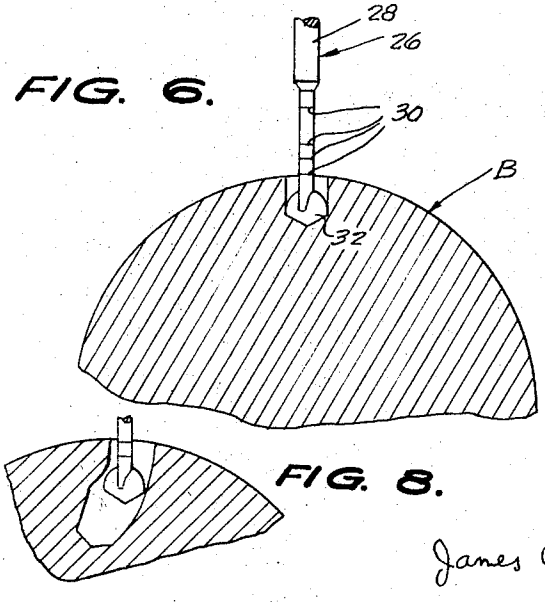


FIG. 6.

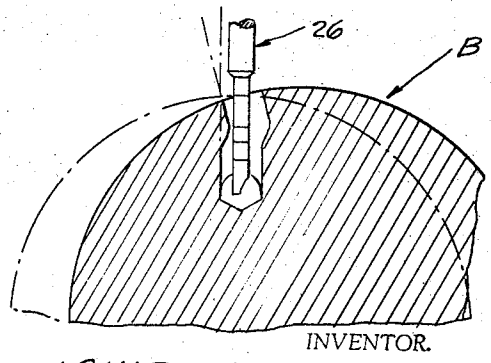


FIG. 7.

FIG. 8.

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United States Patent Office 3,349,647
Patented Oct. 31, 1967

3,349,647

BOWLING BALL DRILLING METHOD AND APPARATUS

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Filed Aug. 31, 1965, Ser. No. 483,993
3 Claims. (Cl. 77—5)

ABSTRACT OF THE DISCLOSURE

Apparatus adapted for use in drilling finger holes in bowling balls and the like, the apparatus involving a work holder attached to a drill and having a pivotal cradle controlled by a reciprocal shaft, and means for controlling the movement of the shaft; and

A method of drilling a bowling ball to provide a lift opening therein wherein the ball is pivoted to alternative positions during the drilling operation.

This invention pertains to bowling balls of the finger grip variety, wherein a ball comprising a substantially solid mass of spherical form is provided with a plurality of finger openings by means of which the user grips the ball and attempts to impart certain movements thereto. More specifically, the invention relates to new and novel means for the drilling of linear or non uni-linear finger grip holes in bowling balls, including both a method and apparatus particularly adapted for carrying out the sequence of steps in the method.

In the sport or game of bowling it is customary to employ a ball as a part of the game apparatus. Bowling balls of one type are conventionally of solid, spherical form, and have a plurality of grip holes therein—usually a thumb hole and two finger holes. An object of the present invention is to provide a ball of this type having holes therein of improved forms.

Another objective of primary importance herein resides in the provision of an improved support for the changeable positioning of a substantially spherical object, in the form of work holder with variable work positions. A related advantage of the invention is to supply a work holder with suitable indicia to enable the operator to uniformly relate the workpieces supported therein to tool elements.

Yet another object of the work holder is to provide a stable, trouble-free, and dependable clamping means for a spherical object which is quickly and readily opened and closed, and which requires little or no adjustment in use.

A further object is to provide a cutting bit particularly adapted to the formation of multi-linear gripping holes in bowling balls, or the like.

Other and further objects and advantages of the invention will become apparent to those skilled in the art from a consideration of the following specification, when read in conjunction with the annexed drawings, in which:

FIGURE 1 is a perspective view of an apparatus employed in the drilling of a bowling ball in accordance with the teachings of this invention;

FIGURE 2 is an enlarged side elevational view of the apparatus partly in cross-section along the line 2—2 of FIGURE 1, looking in the direction of the arrows;

FIGURE 3 is a top plan view of the apparatus, partially broken away;

FIGURE 4 is a vertical cross-sectional view taken substantially on the section line 4—4 of FIGURE 2, looking in the direction of the arrows;

FIGURE 5 is a detail horizontal cross-section on the line 5—5 of FIGURE 2, looking in the direction of the arrows;

FIGURE 6 is a sectional view of a portion of bowling ball, showing the completion of a first step in a method hereof;

FIGURE 7 is a view similar to FIGURE 6, disclosing a second step; and

FIGURE 8 is a view similar to FIGURES 6 and 7, showing a modified method step employing the apparatus hereof in the drilling of a finger grip.

With more specific reference to the drawings, illustrated therein throughout the several views is apparatus **10** particularly adapted for carrying out a novel drilling method hereof, although the apparatus **10** is not limited to such use, and may be employed in other work holding and drilling operations. In FIGURE 1, the apparatus **10** is shown as used with a conventional drill press **12** which has a bed **14** on which is mounted a plate **14***a* with a dovetail groove **16** therein, a standard **18**, and a drill head assembly **20** arranged over the bed. The assembly **20** includes a chuck **22** and an operating handle **24** by means of which the chuck is raised and lowered with respect to the bed. Drill press **12** illustrated herein is conventional, and any suitable drilling means may be substituted therefor.

A special drill bit **26** is provided, however, and is mounted in the chuck **22**, the bit **26** has a shank **28** enlarged at its connection end and having a plurality of lines **30** inscribed thereabout, comprising depth marking indicia, described in more detail below. The bit **26** has an enlarged cutting head **32** with annular lower cutting edges **34** and rounded upper cutting edges **36**. The bit **26** is rotatable with the chuck **22** and vertically moveable therewith by movement of the handle **24**.

The work holder hereof is generally designated in the drawings by reference numeral **38**, and comprises a frame **40** with a flat, substantially rectangular base **42**. The base **42** may be formed from upper and lower elements as shown, and the upper element has a lower surface **44** from which depends a dovetail element **46** received in a corresponding groove in the lower element, and the upper element also has an opposite upper surface **48**. The lower element further has a dovetail element **46***a* (FIGURE 1) received in the slot **16** of the bed **14** and the bed has a screw operated positioning crank **50** (FIG. 4) effective to locate the base **42** in a desired position with respect to the drill. The base has a forward side **52**, rear side **54** and ends **56**, **58**, as well as a peripheral edge **60**.

Fixed to the upper surface **48** of the base **42** adjacent the ends **56**, **58** thereof is a pair of opposite side plates **62**, **64**, each having a base flange **66** fixed to said surface. The side plates are thus arranged in upstanding position substantially at the opposite ends of the frame base. Each of the side plates includes an upper end section **68** having substantially co-axial openings formed therein for a purpose described below.

A ball supporting cradle means **72** is mounted between the side plates, and includes a substantially flat, rectangular bottom wall **74** with upper and lower faces **76**, **78** and front and rear sides **80**, **82**. The cradle further has side arms **84** and **86** secured to the bottom wall **74** by flanges **88** in substantially parallel relation to the side plates **62**, **64**, respectively, and the side arms have upper ends **90** with openings **92** therein substantially co-axial with the plate openings **70** and with one another. Substantially cylindrical pivot axles **94** extend through the apertures **70** and **92** of the plates and arms **62**, **84** and **64**, **86**, whereby the cradle is pivotally suspended between the side plates over the frame base **42**, bushings **96** serving to space the arms and plates from one another.

The plate **62** has an indicator plate **98** with indicia **100** thereon fixed to its upper end **68** about the axle **94** and the adjacent arm **84** has an L-shaped pointer **102** located at substantially the center of its upper end **90** and

projecting thereabove. The pointer **102** is related to the indicator plate **98** in such manner as to provide a visual means for determining the inclination of the cradle with respect to the frame.

The cradle bottom wall **74** has a centrally located block **104** secured on its upper face **76**, the block having a cupped detent **106** therein in which a bowling ball may be seated. In addition, a ball clamp assembly is supplied, including a pair of upstanding legs **108** secured at their lower ends **110** to the wall **74** adjacent its rear side **82** by connectors **112**. The upper ends **114** of the legs **108** are bifurcated to pivotally support an outward arm **116** on a pin **118**. An annular ring element **120** is carried on the arms **116** and has a downwardly flared interior wall **122** adapted to fit about a bowling ball. As will be clear, from the above, the ring **120** is swingable over the ball, or may be pivoted to an open position for removal of a ball from the device. Adjacent the forward side **80** of the bottom wall **74**, a pivot mount **126** is secured which supports a generally upright, outwardly bent rod **128**. The rod **128** has an axial bore **130** therein opening on its upper end **132** in which one end of a second rod **134** is slidably seated. The rod **134** has an inward extension **136** at its opposite end adapted to overlie the ring **120**—the extension **136** having a vertical, threaded opening with a lock screw **138** disposed therein. The rods **134** and **128** are connected to one another by a toggle connection including links **140** pivotally secured to the rod **134** at pins **142**, and to the forked ends **144** of a handle **146** at **148**. With the handle in its upwardly disposed position, as shown in the drawings, the rods are effectively locked together, upward movement of the handle serving to exert a downward force on the rod **134**. Downward movement of the handle **146** operates to release the toggle connection, permitting the rod to be extended and swung outwardly from clamping engagement with the ring. The screw **138** permits adjustment of depth for the accommodation of bowling balls of variant diameters.

Depending from the lower face **78** of the bottom wall **74** of the cradle is a pair of connection ears **149** each connected by a pin **150** to the outer ends **152** of one link **154** of a pair thereof. The ears are located adjacent the forward side **80** of the bottom wall, and a pair of fixed blocks **156** is secured to the base **42** in alignment with the space between the ears. The blocks have coaligned, threaded bores therein supporting an elongated screw shaft **158** having a threaded section between the blocks and an outwardly extended, unthreaded section **160** with an end **162**. The shaft is extendable forwardly and rearwardly in the blocks responsive to rotation thereof, and carries, intermediate its ends, a collar **164**. The links **154** are each pivoted to the collar **164** at their inner ends **166**, and are connected to one another at their forward ends **152** by a cross-brace **168** (FIG. 5). A handle **170** is secured to the end **162** of the shaft and a gear **172** is mounted adjacent thereto. As will be seen, forward and rearward movement of the shaft **158** and its collar **164** is effective to transmit controlled pivotal movement to the cradle **72**, tilting the same about the axles **94**.

To aid in holding the cradle in a desired pivotal position, a holding gear means is provided. Said means comprises a block **174** mounted on the base **42**, having a threaded bore **176** formed therein through which a second screw shaft **178** extends. The shaft projects outwardly of the end **40** of the base, and has an enlarged gear wheel **180** thereon in mesh with the smaller gear **172** of the shaft **158**. A stabilizing bracket **182** may be supplied for the second shaft, as shown in FIGURES 2 and 5.

Means is supplied to permit disengagement of gear wheel **180** from the gear **172**. Such means comprises a collar **184** secured to the wheel **180** and having a lock screw **186** therein extending to a key way **188** on the screw shaft **178**. By alternative loosing and tightening of the screw, it is possible to move the wheel **180** forwardly and rearwardly either into or out of engagement with the gear **172**. Thus, where manual tilting of the cradle is desired, the gears are disengaged to permit such manual employment of the device.

The precise inclination of the cradle with respect to the frame is shown on the indicator plate **98** by the pointer **102**.

In the use of the apparatus, the operator initially clamps a bowling ball B in the cradle and locks the same in place by employment of the ring **120** and toggle connection therefor. The ball, it will be understood, has been premarked for drilling in accordance with the needs of a particular user.

In the drilling of a thumb hole, the operator dis-engages the gears **172** and **180**. After the ball has been suitably marked for the location of the holes, it is clamped in the cradle by dropping the ring over the ball and the toggle clamp is engaged. The operator then drills the hole to a selected one of the lines on the shank **26** of the drill. The spindle is then locked and the operator turns the handle **170** in a clockwise direction as seen in the drawing to a desired change in pitch shown on the indicator **98** by the pointer **102**. When the desired change in pitch is reached, the lock on the spindle is released and the hole is drilled to a desired depth determined by a second selected line on the shank of the tool. The tool is then backed out and at the same time the handle **170** is turned in an opposite or counter clockwise direction. As this procedure is completed, the tool rounds off the back of the hole, the upper cutting edge **36** performing this rounding off procedure. This is illustrated in the drawing in FIGURE 8.

In drilling of finger holes, the operator engages the gears **172** and **180**. After the ball has been marked for the desired location of the holes, it is clamped in the cradle as described above. A hole is then formed to a first selected line on the shank of the tool (the depth of selection being a matter of choice depending on the type of hole to be formed). The spindle is then locked and the handle **170** rotated in a clockwise direction to a desired change in pitch as shown on the indicator **98** by the pointer **102**. The rotation of the handle **170** effects rotation of the gear **172** driving the gear **180** in an opposite or counter clockwise direction turning the screw **178** in such manner as to draw the plate **38** containing the cradle involved in a forward direction feeding the ball into the drill for a deeper undercut or lift. When the desired change in pitch is reached, the lock on the spindle is released and the hole is drilled to a depth determined by a further marking **30** on the shank of the tool. The tool is then backed out, and at the same time handle **170** is turned in an opposite direction with the gear **172** driving the gear **180** in an opposite direction turning the screw and forcing the plate **38** to its original position. By this expedient, the tool has rounded off the back of the hole, the upper cutting edge **36** performing the rounding off procedure. The completed finger hole is shown in FIGURE 7.

While particular methods of use of the apparatus have been described, it will be understood that these methods are offered only by way of example, and not by way of limitation. Further, the illustration of a specific embodiment of the apparatus is for illustration purposes, and the invention should be limited in scope only by the appended claims.

What is claimed is:

1. A method of drilling a multi-stage finger lift opening in a bowling ball in a continuous operation, the bowling ball being mounted in a cradle secured to a drilling device with a rotating drill bit therein, the drill bit having an enlarged head with upper and lower cutting edges, the method comprising the steps of:

pivoting the cradle and ball to a position wherein the drill is aligned with the ball at a non-radial first location;

simultaneously advancing the rotating drill into the ball to a first desired depth;

locking the drill against vertical movement while continuing the pivoting of the cradle and ball whereby the upper cutting edges form a first angle portion in the lift opening of the ball;

pivoting the cradle to a second non-radial angle obtusely related to the first non-radial angle while continuing the rotation of the drill thus to provide a second non-radial section of the lift opening;

advancing the rotating drill to a second depth;

pivoting the cradle to a position wherein the drill is substantially aligned with the radius of the ball while continuing rotation of the drill whereby the upper cutting edge forms a second angle portion;

inserting the rotating drill in the ball to a third selected depth; and

withdrawing the drill by reversal of the cradle positions while continuing the rotation of the drill.

2. Apparatus for drilling a finger grip hole in a bowling ball, the apparatus comprising:

a drill assembly including a support and a rotatable drill bit, the support and drill bit being arranged for relative reciprocatory movement;

an apparatus frame secured to the support of the drill assembly;

the apparatus frame including means for mounting a cradle therein;

a cradle pivotally mounted on said means;

means on the cradle for releasably engaging a bowling ball;

a reciprocal shaft connected to the cradle for effecting pivoting of the cradle;

handle means on the reciprocal shaft, and a gear adjacent the handle means; and

control means for the reciprocal shaft, the control means comprising a second shaft having a gear thereon normally meshed with the gear on the reciprocal shaft and being dis-engageable therefrom.

3. Apparatus for drilling a finger grip hole in a bowling ball, the apparatus comprising:

a drill press assembly including a bed, and a drill head arranged over the bed having a rotating chuck;

a drill bit mounted in the chuck, the bit having a shank with plural depth marking indicia thereon and an enlarged cutting head;

the bit having upper and lower cutting edges;

a frame mounted on the bed;

the frame including a base connected to the bed and opposite side plates secured to the base and projecting upwardly therefrom;

a cradle mounted between the side plates, the cradle including a bottom wall with upper and lower faces, and arms secured to bottom walls;

pivot axles connecting the cradle arms to the frame side plates with the bottom wall spaced upwardly from the base;

a cupped ball engaging element secured to the upper face of the bottom wall;

connection ears depending from the lower face of the bottom wall;

a first pair of fixed blocks on the base beneath the bottom wall arranged in alignment with the connection ears, the blocks having co-axial openings therein;

a screw shaft engaged in the openings of the blocks for rotational movement, the screw shaft having an outer end;

a turning handle on the opposite end of the screw shaft and a gear mounted on the shaft adjacent the handle for rotation with the shaft;

a collar engaged on the shaft;

at least one link member having opposite ends, pivotally connected to the collar and the connection ears whereby the cradle is tilted with respect to the frame responsive to movement of the collar occasioned by rotation of the shaft;

a second block mounted on the base, the second block having an opening formed therein;

a second shaft, having an outer end portion mounted in the second block;

an enlarged gear wheel on the outer end of the second shaft in mesh with the gear of the first shaft; and

the cradle having a ball clamping assembly thereon including a pair of upstanding legs on the bottom wall, an annular skirt of a diameter to fit about and clamp a bowling ball, pivotally connected to the legs, and a releasable toggle clamp engaging the skirt and pivoted to the bottom wall.

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