July 2, 1963 A. JESONIS 3,095,767

APPARATUS AND METHOD FOR DRILLING HOLES

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Fig. 1

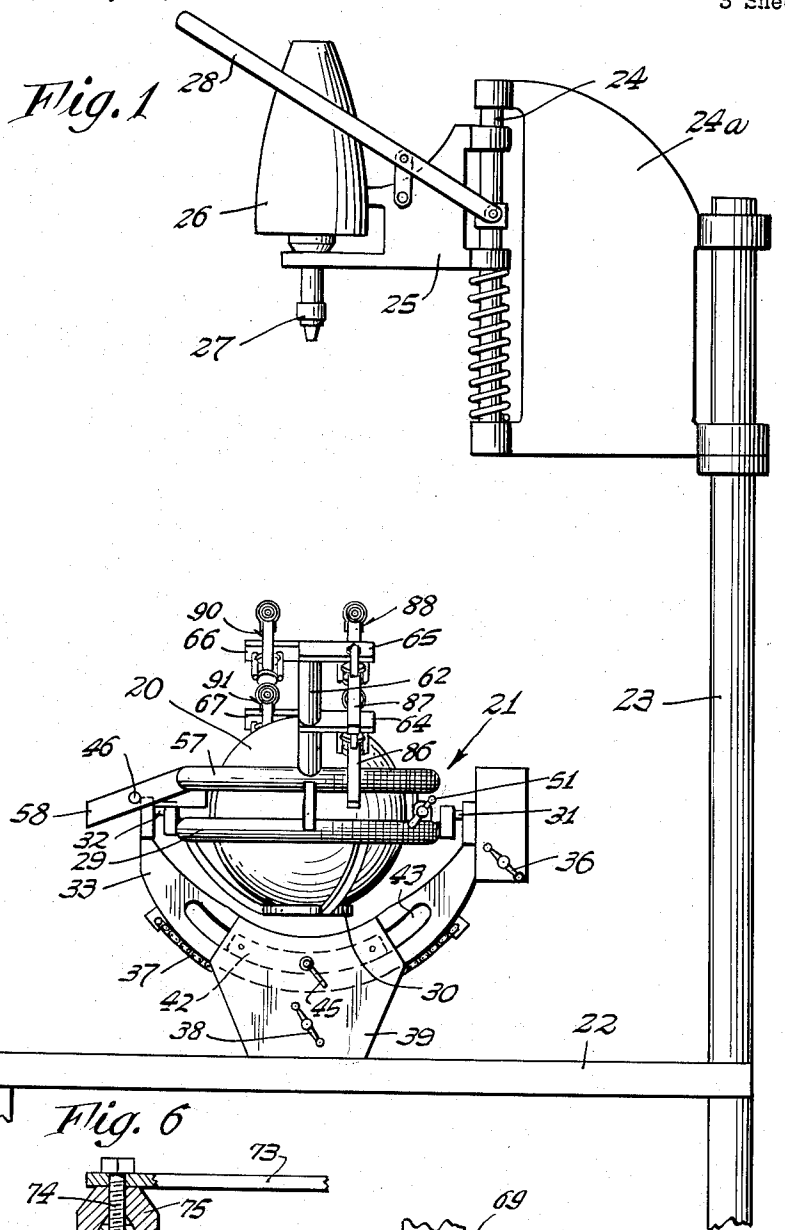


Fig. 6

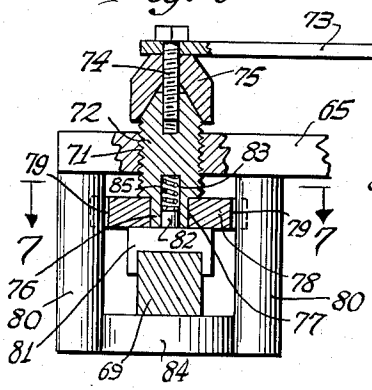
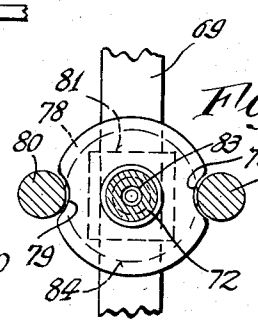


Fig. 7



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APPARATUS AND METHOD FOR DRILLING HOLES

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Fig. 2

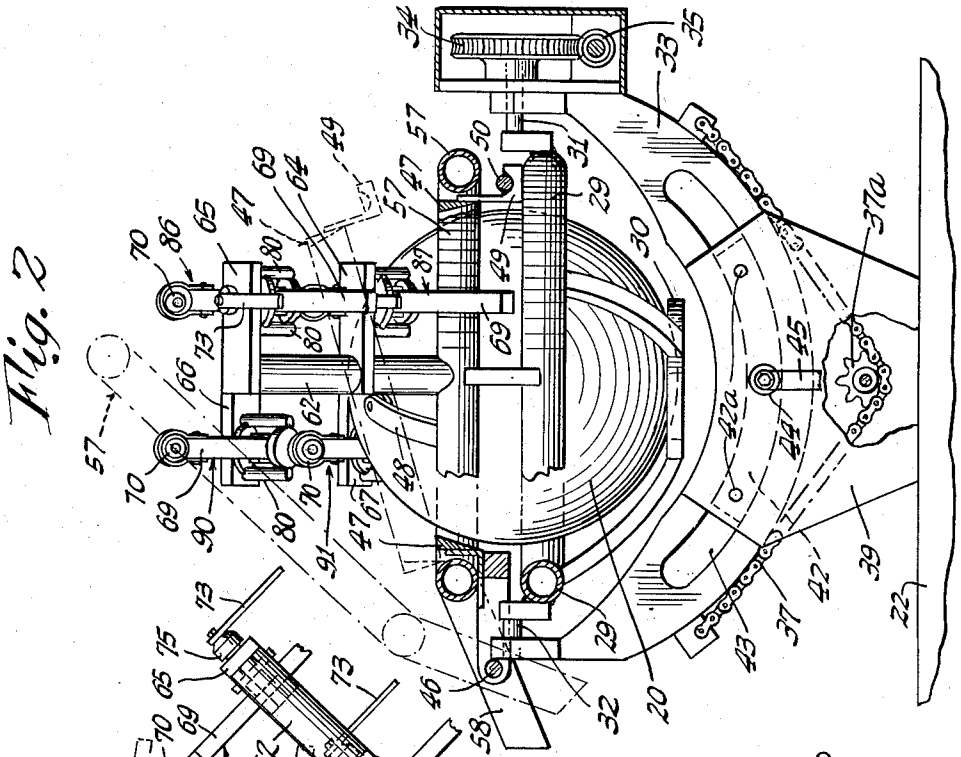

Fig. 3

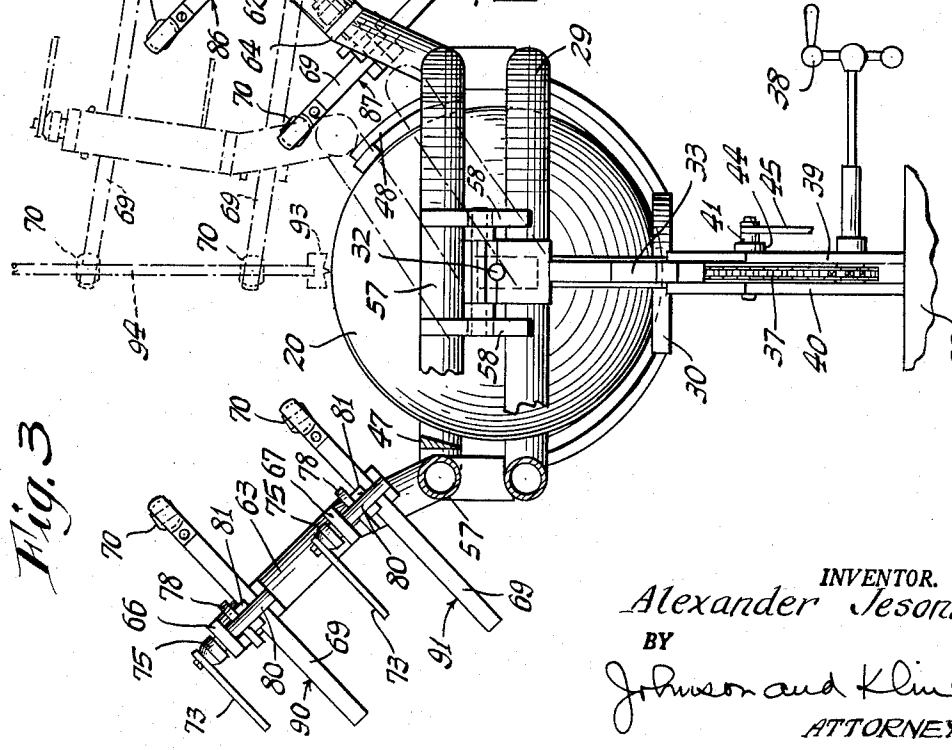

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Fig. 4

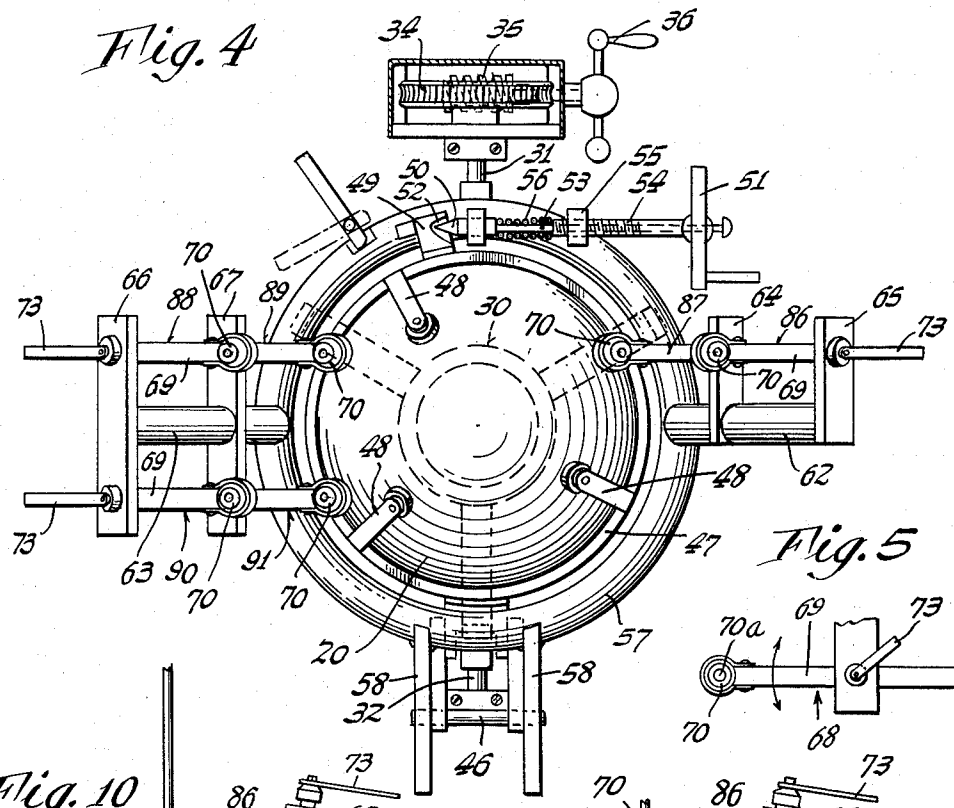


Fig. 5

Fig. 10

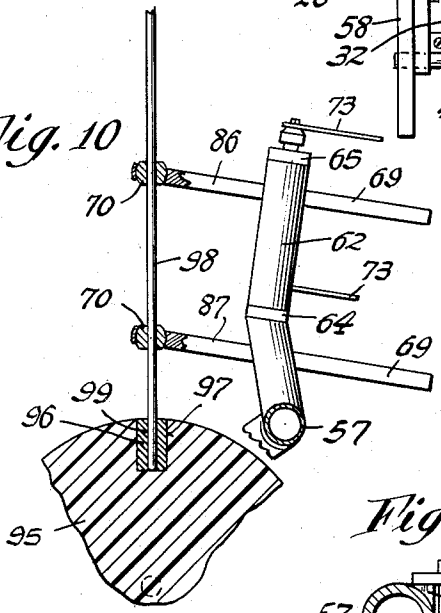


Fig. 11

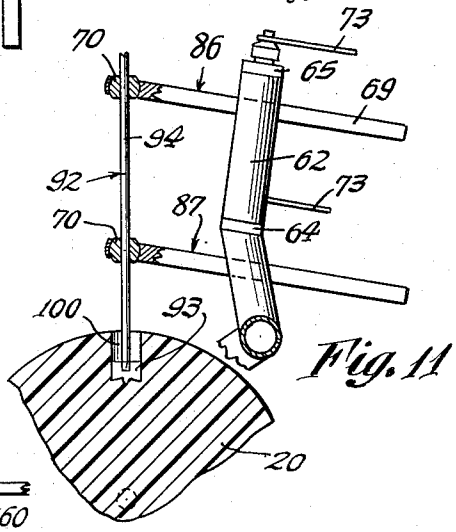


Fig. 9

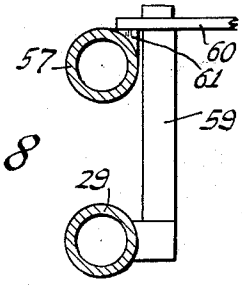
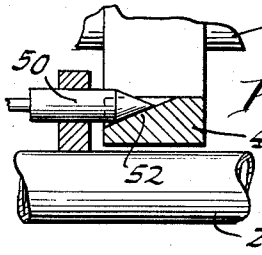


Fig. 8



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United States Patent Office 3,095,767 Patented July 2, 1963

3,095,767

APPARATUS AND METHOD FOR DRILLING HOLES

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Filed May 15, 1961, Ser. No. 110,018
2 Claims. (Cl. 77—62)

The present invention relates to an apparatus and method for drilling holes extending at selected angles and at preselected locations in a spherical member and more particularly to drilling the finger holes in a bowling ball.

Bowling balls of the type used in ten-pin bowling are usually provided with three finger holes (sometimes only two) with the location and direction of the holes generally being selected to fit the individual user of the ball. Thus the relative location of the holes with respect to each other and the direction of the axis of each hole with respect to a radius passing through the center of the ball are important factors in providing a proper fit of the finger holes to a particular individual's hand.

While skill is needed to determine the size, direction and position of the holes, heretofore skill was also required not only to drill the holes in the proper positions with respect to each other but also to drill them with the proper angular direction of the axis of each because of difficulties being encountered in setting and maintaining the drill at the proper position and angle. Moreover the apparatus heretofore known fails to enable the holes to be exactly reproduced from one ball to another ball and additionally of providing the ball user with an indication of the relative direction and position of the finger holes prior to their being drilled.

It is accordingly an object of the present invention to provide an apparatus and method for accurately drilling the finger holes in a bowling ball according to the desire of a particular individual which includes the exact reproduction of finger holes in another ball.

Another object of the present invention is to provide an apparatus in which the directions of the axis of the holes after they are bored or prior to their being bored may be observed and easily changed relative to one another.

A further object of the present invention is to provide an apparatus of the above type which is relatively economical, substantially foolproof in operation, durable, and requiring little training and dexterity for its use.

In carrying out the above objects the present invention provides for a support on which is mounted a ball cradle. The cradle includes a lower member which supports the ball and an upper member which is pivoted with respect to the lower member and releasably clamped thereto.

According to the present invention the upper ring carries toolholders that are relatively movable for holding a hole forming drill such that it can only move longitudinally in the holders. Thus by setting the toolholders in the position that defines the angle of the axis of the finger hole and the position of the hole and then locking them in position a hole only having this angle and position is made. After the toolholders have been locked in the position desired, the ball cradle is movable about two horizontal axes to provide for the positioning of the drill within a vertically moving drill powering member to thereby provide the power for drilling the holes.

With the above apparatus the present invention contemplates the novel method of reproducing accurately the finger holes of a first bowling ball into a second bowling ball. This is accomplished by the step of initially positioning the first bowling ball in the ball cradle, positioning inserts in each finger hole and then providing a guide rod which extends through the toolholders into an axial hole of the insert which aligns the toolholders with the axis of the insert (which is also the axis of the hole). The toolholders are then locked, the guide rod removed, and the second bowling ball positioned in the place of the first bowling ball. A drill of the exact diameter of the hole in the first bowling ball to be reproduced in the second is then placed in the toolholder (they are maintained locked in the position selected by the guide rod) and each of the drills is powered to drill the hole. Thus the exact direction and location of finger holes of one bowling ball may by employing the apparatus and method of the present invention enable the reproduction of the holes in the second bowling ball.

Other features and advantages will hereinafter appear.

In the drawing:

FIGURE 1 is a side view of the apparatus of the present invention.

FIG. 2 is a side view partly in section and somewhat enlarged of the ball cradle of the apparatus shown in FIG. 1 with a ball positioned therein.

FIG. 3 is a front view of the ball cradle shown in FIG. 2, also partly in section.

FIG. 4 is a plan view of the ball cradle shown in FIG. 2.

FIG. 5 is a plan detail of a drill support.

FIG. 6 is a sectional detail of a drill support clamp.

FIG. 7 is a section taken on the line 7—7 of FIG. 6.

FIG. 8 is a detail view, partly in section, of a clamping construction used in the ball cradle.

FIG. 9 is a detail, partly in section, of another clamping construction used in the ball cradle.

FIG. 10 is a somewhat diagrammatical section indicating the positioning of the drill support members by using a positioning rod in a first ball, the holes of which are to be exactly reproduced in a second ball.

FIG. 11 is a view similar to FIG. 10, showing the actual boring of the hole in a second bowling ball which will be a reproduction of the hole in the bowling ball shown in FIG. 10.

Referring to the drawing, a bowling ball in which finger holes are to be bored is generally indicated by the reference numeral **20** and sits within a ball cradle **21** that rests on a horizontal base **22** that, while it may rest on a table or have legs to rest on a floor, is shown in the specific embodiment as being secured to a vertical post **23** that may be secured in vertical position on the floor. A vertical pivot shaft **24** is pivotally supported on the upper end of the post **23** as by a flat link *24a*. Pivotally mounted on the shaft **24** is a plate **25** carrying an electric motor **26** that drives a chuck **27** or other drill or toolholding member. A handle **28** is fixed to the pivot shaft **24** and the plate **25** such that downward movement of the free end of the handle **28** causes the motor **26** and hence a tool attached thereto to be moved vertically downward. The location of the motor driven tool may be easily set by relative pivoted movement between the plate **25** with respect to the pivot shaft **24** and by relative pivotal movement of the pivot shaft **24** with respect to the post **23**.

The ball cradle generally indicated by the reference numeral **21** includes a lower ring **29** having a depending bottom saddle **30** secured therebeneath. The ball cradle including the lower ring is mounted for pivotal movement about two horizontal axes for reasons which will be hereinafter apparent and accordingly includes a pair of pivot pins **31** and **32** pivotally mounted in the ends of an arcuate support **33**. The pivot pin **31** extends through the end of the arcuate support **33** to have fixed thereto a gear **34** that is rotated by a worm **35**, the latter being connected to a handle **36** such that rotation of the handle **36** causes rotation of the ring **29** about the axis connecting the two pivot pins **31** and **32**. For pivoting the cradle about an axis in the same horizontal plane but perpendicular to the aforementioned axis, the support **33** is provided with a chain **37** that is engaged

by a sprocket wheel 37*a* manually rotatable by a handle 38.

The support 33 is movable between a pair of parallel support plates 39 and 40 (FIG. 3) fixed to the base 22 and a clamping bolt 41 extends therebetween through an arcuate channel 43 formed in the support 33. Also positioned in the channel 43 is an arcuate rail 42 that is fastened to the plate 39 as by rivets 42*a* to provide a guide for pivotal movement of support 33. The bolt 41 is threaded into the plate 40 and has a flange 44 that abuts the plate 39 so that upon rotation of a handle 45 secured to the bolt 41 the plates 39 and 40 are forced together to clamp the support 33 in the position to which it may be adjusted by rotation of the handle 38.

As shown in FIGS. 2, 3 and 4, the end of the support 33, slightly above the pivot pin 32, includes a horizontal pivot shaft 46. Pivotally mounted on this shaft is a ball clamping ring 47 having fingers 48 that engage the upper surface of the ball to clamp it between the saddle 30 and the fingers 48. The clamping ring 47 is secured to the lower ring 29 by the ball clamping ring having a projection 49 (FIG. 4) that extends downwardly, outside of the ring 47 to be in the path of the tapered end of a horizontally movable member 50. The member 50 is operated by rotation of handle 51 which causes the member 50 to be moved, as shown in FIG. 4, leftward as against an inclined surface 52 (FIG. 8) formed in the projection 49. In order to releasably clamp the ball clamping ring in position, the member 50 includes a rod portion 53 slidable in an exteriorly threaded tube 54 connected to the handle 51 with an interiorly threaded boss 55 threadingly supporting the tube 54 such that rotation of the handle 51 rotates the tube 54 for axial movement thereof which compresses a spring 56 to resiliently bias the projection 50 onto the inclined surface 52 of the projection 49.

The ball cradle of the present invention further includes an upper ring 57 that is pivoted on the pivot shaft 46 as by legs 58 and adapted, in its locked position, to overlie the clamping ring 47. For securing the lower ring in its locked position, shown in full lines in FIGS. 2, 3 and 4, to the lower ring, the lower ring 29 has an upstanding post 59 on which is pivoted a locking handle 60 that has one end that engages a step 61 formed on the upper ring 57. The ring 57 thus may be pivoted onto and clamped with respect to the lower ring and be released and pivoted away to enable a ball, after opening of the ball clamping ring, to be removed from the ball cradle.

The upper ring according to the present invention provides for locating and positioning tools and hence has on opposite sides thereof standards 62 and 63 with parallel, spaced cross members 64 and 65 secured on the standard 62 and parallel, spaced cross members 66 and 67 secured on the standard 63. Secured to each of the members 64 and 65 and to each of the cross members 66 and 67 on one side of the standard 63 and on the other side of the standard 63 is a toolholder generally indicated by the reference numeral 68. There are thus six toolholders with each being identical and being mounted in an identical manner on their cross members so that they may be moved with respect thereto and then clamped in position. Each toolholder includes a rectangular bar (FIG. 5) 69 having a swivelly mounted bearing 70 secured at one end thereof with an aperture 70*a* formed in the bearing 70.

Each of the toolholders is mounted to their cross members in the manner shown in FIG. 6 and which provides for longitudinal movement of the rectangular bar with respect to the cross members and also pivotal movement of the bar about an axis perpendicular to the cross members. This is accomplished for each toolholder by providing a threaded aperture 71 in the cross member 65, for example, and having an exteriorly threaded screw rod 72 extend therethrough in threading engagement with the aperture 71. The upper end of the rod 72 has secured thereto a handle 73 as by a bolt 74 and a friction member 75 such that tightening of the bolt 74 causes frictional engagement between the handle 73, the member 75 and the rod 72. The other end of the rod 72 has a reduced end portion 76 which fits into a central aperture 77 formed in an annular disk 78. The disk 78, as shown in FIG. 7, has two arcuate cutouts 79 which slidingly fit depending pins 80 fastened to the cross member 65 thereby preventing relative rotation between the disk 78 and the cross member upon rotation of the handle 73. A U-shaped member 81 has a stud 82 extending upwardly therefrom to be positioned within an axial aperture 83 formed in the rod 72 and the member 81 straddles the upper surface of the rectangular shaft 69 of the toolholder while the lower surface of the shaft 69 rests on a base 84 secured to the pins 80. It will thus be seen that upon turning the handle 73, the shaft 69 is loosened to thereby be able to be moved longitudinally of itself by sliding movement between the base 84 and the U-shaped member 81 and also may be pivoted (with the pins 80 as limits) about an axis of the stud 82. A spring 85 urges the U-shaped member into engagement with the shaft 69 to provide a frictional maintaining force for maintaining the shaft 69 in position prior to it being clamped into position by a reverse movement of the handle 73.

As shown in FIGS. 2, 3 and 4, there is provided on the standard 62 a pair of toolholders 86 and 87, on the standard 63 drill supports 88 and 89 and 90 and 91 with the drill supports 86 and 87 being for the thumb hole, supports 88 and 89 for one finger hole and 90 and 91 for the other finger hole. It will be clear that a drill 92, such as the type shown in FIG. 11 having a drilling point 93 and a shank 94 is sufficiently long to not only extend between each pair of toolholders but to extend therebeyond a substantial distance. Moreover, it will be clear that the toolholders by being movable may thus support the shank of the drill so that the drill may be placed in substantially an infinite number of positions both with respect to angle and position of the drill head to thereby drill a finger hole having such a position and angle.

When it is desired to reproduce in a bowling ball the finger holes that are desired as to direction and location, which may be determined from a master ball, generally indicated by the reference numeral 95 (FIG. 10) the master ball 95 is positioned in the ball cradle, the inner ring 47 clamped thereto by manipulation of the handle 51 and the upper ring clamped by the handle 60. A tubular insert 96 having an outside diameter substantially equal to the inside diameter of a finger blade 97 in the master ball which is desired to be reproduced in the bowling ball 20 is positioned in the hole 97. The tool supports 86 and 87 are loosened for movement (if the hole 97 is a thumb hole) and a guide rod 98 is passed through the tool supports 86 and 87 to extend into an axial aperture 99 formed in the insert 96. The toolholders 86 and 87 by being free to move enable the rod 98 to extend into the aperture 99 and hence indicate the direction and position of the hole 97. When this is accomplished the toolholders are locked in position as by operation of their handles equivalent to handles 73.

If the other holes are to be copied, similar inserts 96 are positioned in the holes and the guide rod used to align the toolholders with the axis of the hole and they are then clamped in position. With all the toolholders clamped in position, the guide rods 98 are removed from the toolholders. The handles 51 and 60 are manipulated to unclamp the upper ring and the clamping ring respectively so that they may be pivoted on the pivot shaft 46 to enable removal of the master ball 95 from which the inserts 96 may be subsequently removed. The ball 20 in which the holes of the master ball are to be repro-

duced is then positioned in the lower ring secured in place thereon. Drills such as drill **92** having a drilling point of the size of the hole to be copied and this may be determined by the outside diameter of the insert that was used in the hole being reproduced, are positioned in the toolholders **86** and **87** and the upper ring **57** clamped in place. With the ring **57** clamped and with no change in the drill stands **86** and **87** it will of course be clear that by rotation of the drill shaft, an aperture **100** will be drilled in the ball **20** which corresponds both as to size, direction and location with the hole in the master ball **95**.

The drill **92** is preferably driven by the motor **26** and thus the ball cradle **21** by operation of the handles **36** and **38** is moved to position the drill **92** vertically as shown in dotted lines in FIG. 3. The motor **26** and its chuck **27** are pivoted on post **23** and plate **25** until it is vertically aligned with the drill **92** to which it is then lowered and secured. Operation of the motor **26** will thus drive the drill **92** to bore the hole **100**.

It will further be clear that with the present invention the relative direction of the axis of the three finger holes of the bowling ball may be visually observed by the position of the rods **98**. Having observed this, an observer may easily effect slight changes with respect thereto merely by movement of the drill supports of the drill for the finger which is desired to be changed. This is an important concept of the present invention in that it provides to the observer a correlation of the axis of the three finger holes.

It will accordingly be appreciated that there has been disclosed an apparatus for drilling the finger holes in a spherical member such as a bowling ball which is relatively simple in construction and requires little skill for operation. The apparatus includes toolholders mounted on a pivoted ring with the toolholders being manipulatable to position a drill at the exact location where it is desired to drill a hole and also to align the drill such that the axis of the hole will be that desired. Moreover, according to the present invention, the drill axis may be copied from the axis of a hole in another bowling ball wherein it is desired reproduce the same hole by employment of a guide rod that initially fits the toolholders to position them and accordingly a drill subsequently placed in the toolholders can only be longitudinally moved in the selected position and thus an accurate reproduction of the hole of the first bowling ball is assured.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. An apparatus for drilling two finger holes in a bowling ball comprising a ball cradle including a fixed ring for supporting the ball, and a movable ring pivotally mounted for movement between a ball removing position and a ball clamping position and means for clamping the ball in the cradle; cradle mounting means for mounting the cradle for pivotal movement about a pair of transverse horizontal axes; a first pair of spaced apart drill support means adapted to support a drill for drilling one finger hole; a second pair of spaced apart drill support means adapted to support another drill for drilling the other finger hole; each support means including a shank having a swivelly mounted member at an end with a through aperture formed therein; means for mounting each drill support member on the movable ring for independent movement of each with respect to the movable ring; and drill powering means mounted for vertical movement and adapted to power the drills.

2. The method of reproducing a hole in a first bowling ball in a second bowling ball as to direction, diameter and position comprising the steps of supporting the first bowling ball, inserting a tubular insert in said hole having an exterior diameter substantially equal to the diameter of the hole and an axial bore, aligning two guides with the axis of the hole in the first ball to be reproduced by moving the end portion of a guide rod connected to the two guides into the bore of the insert, maintaining the two guides in the aligned position, substituting the second bowling ball for the first ball, removing the guide rod from the two guides, supporting a drill having a diameter substantially equal to the exterior diameter of the insert in both guides for only longitudinal movement of the drill and powering and moving the drill along its axis to drill the hole in the second bowling ball.

References Cited in the file of this patent

UNITED STATES PATENTS

741,364	Ott	Oct. 13, 1903
2,349,394	Widdis	May 23, 1944
2,350,919	Pearson	June 6, 1944
2,643,557	Grove	June 30, 1953
2,915,789	Dykstra et al.	Dec. 8, 1959
2,991,668	Keller	July 11, 1961