United States Patent

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[15] **3,689,165**

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[54] **TEMPLATE CONTROLLED BOWLING BALL DRILLING MACHINE**

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[52] **U.S. Cl.**.....**408/3,** 408/109

[51] **Int. Cl.**.....**B23b 41/00,** B23b 49/02

[58] **Field of Search**.....408/1, 39, 109

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[57] **ABSTRACT**

A finger hole in a bowling ball is contour-drilled by mounting a bowling ball on a carriage and moving the carriage along rails toward the drill which has a larger cutting head than shank. After the first portion of the bore is completed, carriage motion causes it to engage a template which moves it on a second path to further drill the hole in another direction. The drill can be angularly positioned to provide shank clearance and can be positioned so that the drilling is other than radial of the ball.

8 Claims, 6 Drawing Figures

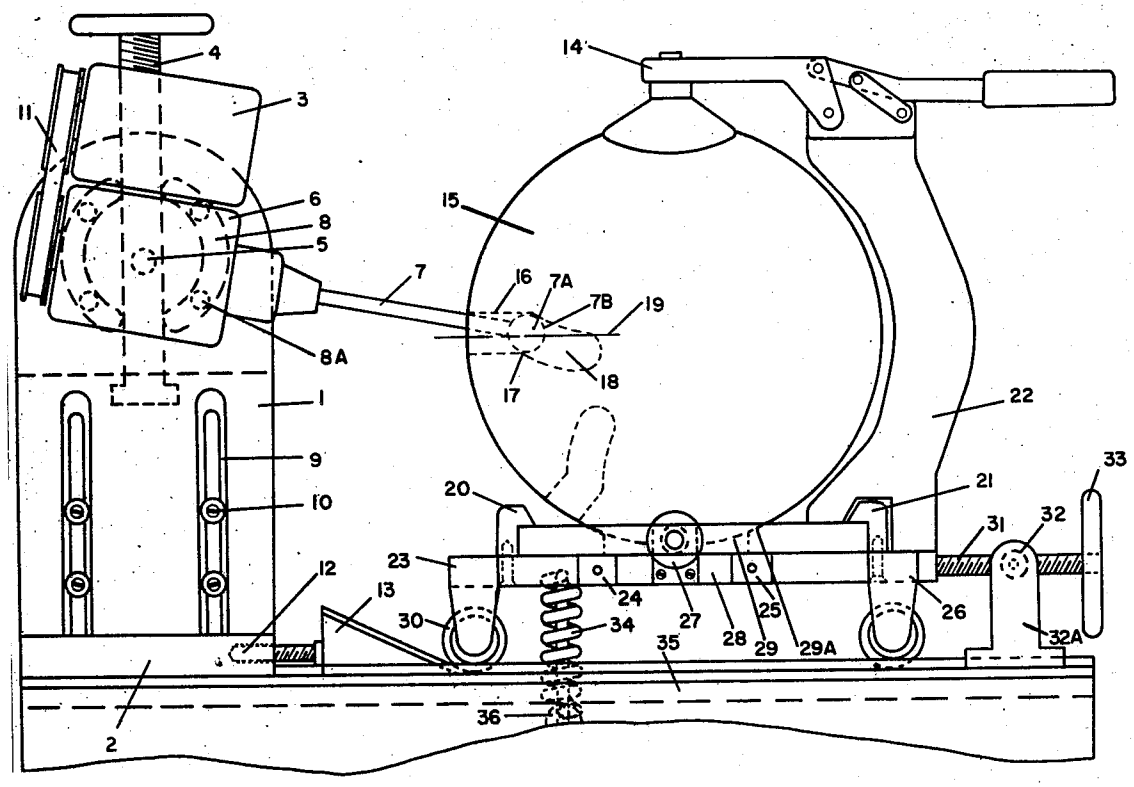


FIG. 1.

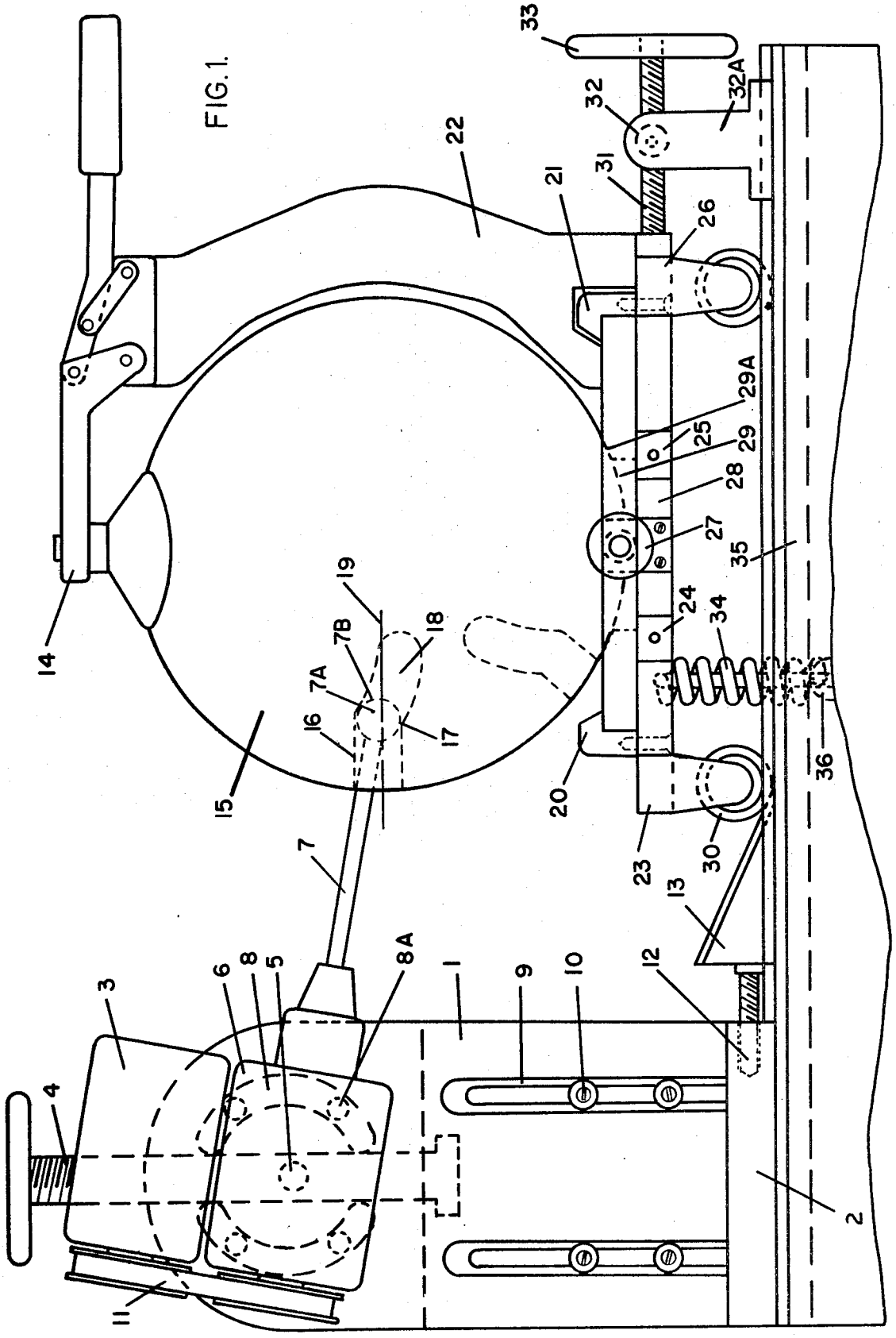
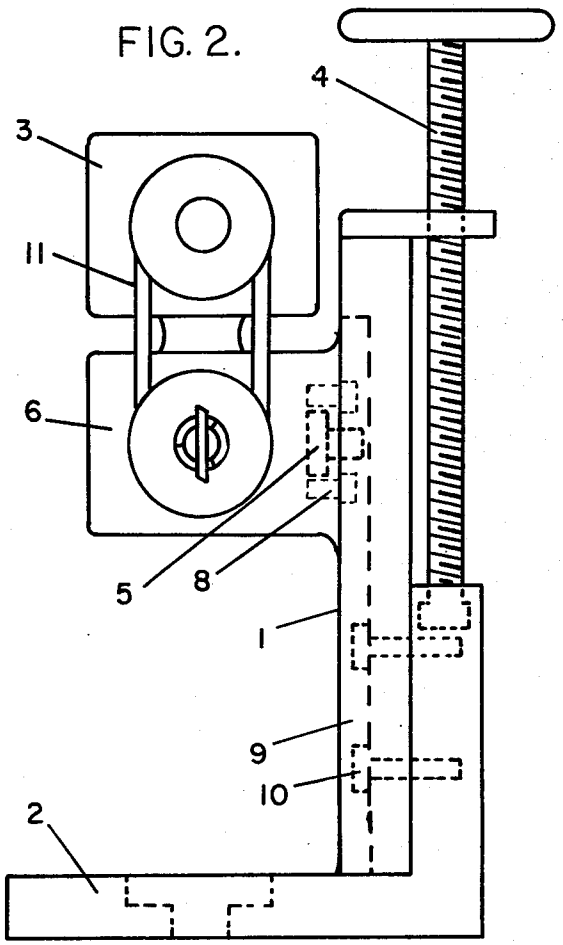

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FIG. 2.



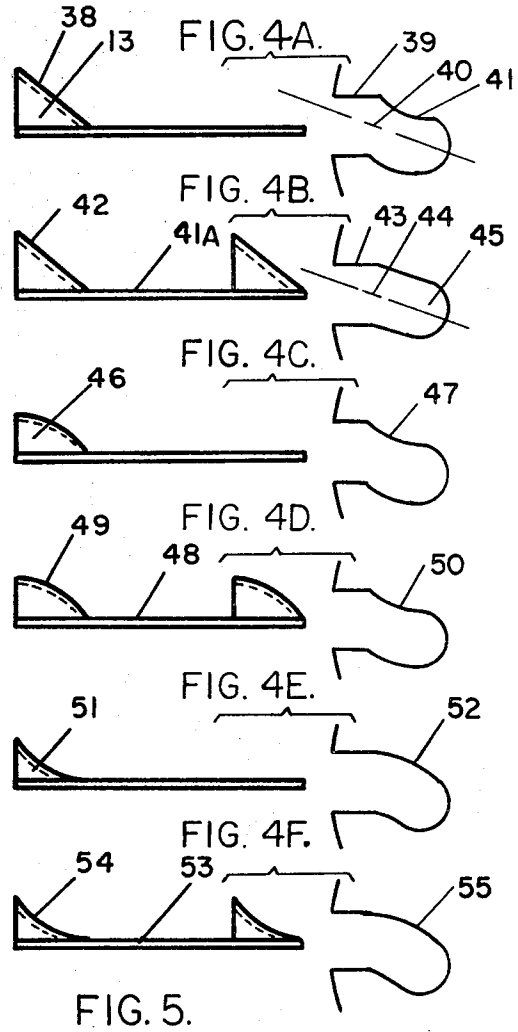


FIG. 3.

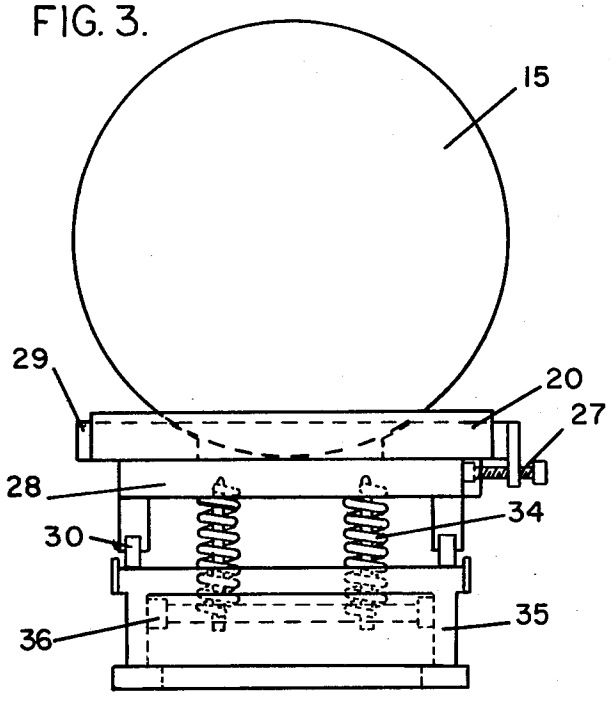


FIG. 5.

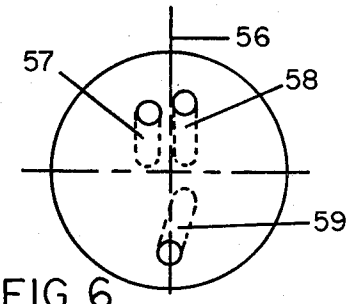
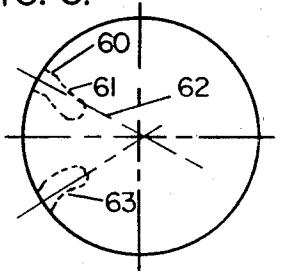


FIG. 6.



TEMPLATE CONTROLLED BOWLING BALL DRILLING MACHINE

BACKGROUND OF THE INVENTION

The present invention relates to a machine capable of boring straight and/or contoured holes in one continuous motion, particularly referring to the thumb and finger grips in bowling balls conforming in contour to one and/or two adjacent phalanges.

As is generally known, the thumb and finger grips in a bowling ball are of the utmost importance, if one is to maintain a firm hold on the ball during the approach and delivery of same. It is during this approach, when the ball is at the lowest point of the swing or arc, that the ball exerts its strongest force. At this point, the bowlers forward momentum and the weight of the ball tend to wrest the bowling ball from ones hand. Any slippage or undue force exerted by the bowler here, may very well interfere or disrupt the smooth and coordinated follow-through necessary to execute the second most crucial point of the delivery; namely the precise moment when the bowler releases his grip. Smooth delivery is necessary to send the ball on a most consistent path to itsdesired target. It can be readily understood that a bowling ball which is properly fitted to an individual's particular needs or specifications is one that would utilize a maximum grip with a minimum of effort. Such would be of considerable benefit to a bowler, especially to bowlers with weak hands, such as women and teen-agers.

In order to more fully understand the present invention, it can be stated in essentially summary form that it is directed to a template-controlled bowling ball drilling machine wherein the drill and bowling ball are moved relatively to each other along a first path and then along a second, template-controlled path so that the bowling ball is drilled with a finger bore having two significantly different portions thereof. The first drilled portion extending into the ball from its surface is preferably linear, but may be non-radial of the ball, while the second drilled portion farther in the ball is preferably curved.

Thus, it is an object of this invention to provide a machine that can simply, quickly, and accurately bore a variety of straight, angular, arcuate, or elliptical holes in bowling balls which will very nearly conform to the shape and size of the hand and to the breadth, length and contour of the fingers.

It is another object of this invention to provide a machine that will bore predetermined sizes and lengths of straight, arcuate, or angular holes to specifications requested.

It is yet another object of this invention to provide a machine that will bore thumb and finger hole grips in bowling balls in such a manner as to eliminate or at least minimize the possibility of a bowling ball slipping or dropping out of a bowler's hand during the approach and delivery of the bowling ball.

Yet another object of this invention is to provide a machine which will duplicate a given bore from information and data supplied.

Another object of this invention is to provide a machine capable of boring a straight or contoured grip in bowling balls wherein the thumb hole is elongated laterally to conform to the oval outline of the thumb.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a front elevational view of all the component parts relating to the function of the machine, showing a bowling ball in which a finger hole has already been bored with a straight and curved configuration and in which the thumb hole has similarly been bored and the special drill is now being retracted.

FIG. 2 is a side view right, of the drill holding boring mechanism with its relative components.

FIG. 3 is a left side elevational view of the traversing work holding mechanism showing the most critical movable portions of the assembly.

FIGS 4A through 4F are schematic side views of various template shapes, and showing the corresponding shapes of drilled holes in the bowling balls resulting therefrom.

FIG. 5 is a top plan view of a bowling ball showing the lateral and angular offsets possible utilizing the lateral adjustment of the ball holding fixture and the vertical adjustment of the drill holding unit of the bowling ball drilling machine of this invention.

FIG. 6 is a side view of a bowling ball showing the radial or pitch angles possible by utilizing the vertical adjustment of the drill holding fixture.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIGS. 1 and 2 show the vertical adjustment plate **1**, which is mounted to angle plate **2**, and is integrated into the assembly by solid base **35**. The electric motor **3**, supplies the power to drill holding chuck **6** through V-belt **11**. Swivel pin **5**, in conjunction with circular slots **8** and **8A**, bolts **8A**, permits the setting of drill holding chuck **6** at whatever angle is necessary when boring a straight and concave configuration. In such boring, the drill shank **7** must clear the upper outermost portion of straight bore **16** and also clear the lower intersecting point **17**, when the drill head **7A** is at its deepest point. The angular setting provides these clearances.

Elongated vertical slots **9** with locking bolts **10**, restrain the vertical adjustment plate after using the adjusting screw **4**. This adjustment permits the alignment of drill head **7A** to the vertical center of bowling ball **15**, or at any desired position above or below the horizontal center of the bowling ball. Adjusting screw **12**, places the templates **13** at a predetermined position relative to the length desired for straight bore **16**, after which the ball holding fixture on carriage **28** commences to rise upward on the templates. This motion causes a relative downward action of the drill head **7A** with a resultant elliptical concave arc **18**. Drill head **7A** is a general grade of tungsten carbide, brazed into a rigid hardened steel shank. Different drills **7** with their heads **7A** ground in progressive diametrical increments, provide the sizes needed to fit any individual requirements.

The traversing movable portion shown in FIG. **1** consists of a rigid plate **28** which forms a carriage, to which are solidly attached four roller bearings **30**, one at each corner, enabling said plate to traverse freely on solid base **35**.

Resting on plate **28** is the lateral adjustment carriage **29**, which is held down and nested to carriage **28** by

two angular gibs 20 and 21. An angular circumferential cavity 29A is incorporated into plate 29, which conforms to the lower diameter of a bowling ball for the purpose of seating same. Toggle clamp 14 and post 22, which is bolted to plate 29, hold the bowling ball firmly in place during a boring operation. Adjustment screw 27 permits for very accurate settings for any positioning required for lateral location. This adjustment provides the necessary movement of plate 29 to either left or right, which enables one to perform a variety of lateral offsets contingent upon the requests of the using party. The result of this function is defined in FIG. 5. Linear movement of the carriage or ball holding fixture 28 is accomplished by the use of a simple external acme thread bolt 31, incorporated with an internally threaded swiveling bushing 32, which is mounted to solid base 35, by post 32A. Powered feed for the ball holding fixture is optional. Tension springs 34, exert pressure downward on carriage 28 by means of rollers 36 located at the underside of the top flange of solid base 35. This tension provides the stabilizing action needed to keep the traversing fixture 28 from wandering during a boring operation.

Relocating the two front forks 23, with bearings 30, to a position rearward at slot 24 will decrease or make for a less sharp rise, commencing at intersecting point 17, resulting in a more elliptical or less circular form at bore 18, or relocating the two rear forks 26 to a position forward at slot 25 will increase or make for a much sharper rise commencing at intersecting point 17 resulting in a less elliptical or more circular form at bore 18. This function only being brought forth by way of showing the added versatility of the machine.

FIG. 2 is a side view right, with drill holding chuck 6 positioned in a horizontal plane. The electric motor 3 is connected to drill holding chuck 6 by V-belt 11. This figure shows the details of the vertical adjustment plate 1.

FIG. 3 is a side view left showing the details of the arrangement of the lateral adjustment screw 27, the roller bearings 30 of the carriage 28 seated on solid base 35. The tension springs 35 with roller bearings 36 are shown in relation to the underside portion of the upper flange of solid base 35. This figure also shows gib 20 and lateral adjustment plate 29.

FIGS. 4A through 4F are comprehensive side views of six basic designs of templates or risers when the templates are used in sets of two, one at each side, setting on top of solid base 35, and linearly aligned with roller bearings 30, they constitute the means of diverting traversing carriage 28 upward. This results in relative downward travel of drill head 7A with respect to the ball with the resultant configurations designed herewith. Referring to FIG. 4A, all four bearings riding on solid base 35, the inward path of traversing carriage 28 will bore the predetermined breadth and length of straight axial bore 39 in a continuous motion. Upon reaching contact with template 13, the two front bearings 30 proceed upwards at a desired angle while the two rear bearings continue at a horizontal. The combination of non-conforming paths develop into a non co-axial angle 40 and result in a concave elliptical arc 41 coincident with desired angle 38. Referring to FIG. 4B, templates 41A are used in tandem so that all four bearings 30 are diverted upward simultaneously. This would result in first the straight axial bore 43 and then a straight non co-axial angle 44 and bore 45, which would be an exact duplicate of template angle 42. As indicated successively in FIGS. 4c through 4F, templates 46 at the desired placement would bore a straight radial hole and develop into a non co-axial elliptical arc 47, templates 48 would bore a straight radial hole and then develop into an arcuate form which would be a duplicate of arc 49. Templates 51 would also bore a straight axial hole and continue on into a non co-axial convex elliptical bore 52. Templates 53 would bore a straight axial hole and continue on into concave form 55 which would be a duplicate of arc 54. All configurations in FIGS. 4A through 4F show a thumb hole in a bowling ball with all angles and arcuate forms in various shapes and angles for opposing finger holes in the ball shaped in the same manner.

FIG. 5 now shows a top view of a bowling ball with middle finger hole 57 and ring finger hole 58 bored parallel to a central plane. These holes are offset the desired distance to the left of the vertical center line 56. This arrangement is commonly referred to as an offset grip. The thumb hole 59 is bored in a relatively true course to the horizontal center of the bowling ball, but at an angle right of the vertical center 56. This type bore is referred to as right pitch.

FIG. 6 shows a side elevational view of a different bowling ball wherein the straight axial bore 60 is directed at the actual center of the ball 62, and the non co-axial portion 61 is contoured to accommodate the outer phalanx of the bowler's bowler's The finger hole 63 is bored so that it starts in a theoretical line to center then has an elliptical bore convex to the thumb, but concave to the outer phalange of the finger. This configuration is called a contour finger tip grip.

Although, the invention has been described and illustrated in detail in its preferred embodiment it is done by way of example only.

I claim:

1. A machining device for boring contoured thumb and finger holes in bowling balls comprising:

a stationary drill holding unit;

a ball holding means for holding a bowling ball, means mounting said ball-holding means for traversing said ball-holding means with respect to said drill-holding unit along a linear path toward said drill-holding means, said drill-holding unit being lockable with respect to said path;

means for reciprocal propulsion of said ball-holding means along said path;

means for lateral transverse adjustment of said ball-holding means with respect to said path;

a template positioned to be engaged by said ball-holding means as it moves along its path at a predetermined location to divert the said ball-holding means from said linear path to drill a hole which has a portion parallel to said path and a portion non-parallel to said path.

2. The machining device defined in claim 1 wherein said means for propulsion of said ball-holding means has sufficient stroke that it is capable of sufficient movement for producing a straight cylindrical bore from the outside surface of the ball for a distance corresponding to the inner phalanx of the thumb ad then sufficient additional movement for producing a bore

extending in a direction non-parallel to said path for a distance corresponding to the length of the outer phalanx of the thumb.

3. The machining device defined in claim 1 wherein said template is formed so that said mounting means for said ball-holding means moves said ball-holding means with respect to said stationary drill-holding unit so that, during motion of said ball-holding means on said linear path, a hole is drilled from the outer surface of a bowling ball parallel to said path and said template is formed so that, after the parallel hole is bored to a predetermined depth, the ball is diverted from said path so that the direction of the hole beyond the predetermined distance is non-parallel to said path.

4. The machine device of claim 3 wherein the non-parallel bore in the bowling ball is straight.

5. The machining device of claim 3 wherein the non-parallel bore in the ball is curved.

6. A machining device for boring hole grips into bowling balls comprising:

first mounting means for carrying a first portion of said machining device thereon;

second mounting means for carrying a second portion of said machining device thereon;

one of said portions of said machining device comprising drilling means for carrying a drill for rotation on a drill axis and the other portion of said machining device comprises bowling ball-mounting means for the mounting of a bowling ball thereon to be bored;

guide means for guiding relative motion between said first and second mounting means, said guide means comprising a base on which said first mounting means is reciprocably mounted for guiding said first mounting means along a path, said path being non-parallel to said axis of said drilling means;

template means on said base for engagement by said first mounting means after said first mounting means has moved a predetermined distance along said path to move said first mounting means on a path away from said path so that a hole bored in a bowling ball mounted on said bowling ball-mounting means has a portion parallel to said path and a portion non-parallel to said path.

7. A bowling ball finger hole boring machine comprising:

a base, a track on said base;

a carriage movably mounted on said track on said base for movement along a first path with respect to said base;

bowling ball-mounting means on said carriage for mounting a bowling ball on said carriage;

a template mounted on said base for engagement by said carriage, said template being positioned so that, after said carriage moves a predetermined distance along said path, at least part of said carriage is deflected by said template to move in a direction other than along said path so that a bowling ball mounted in said bowling ball-mounting means has a portion which moves along said path to a predetermined position and then moves away from said path in a direction controlled by said template;

a drill head mounted on said base for carrying a drill having a cutter head and a shank of smaller diameter than its cutter head and rotating the drill about an axis so that the cutter head bores a hole in the bowling ball in accordance with carriage motion along said path and as deflected by said template.

8. The bowling ball-drilling machine of claim 7 wherein said axis of said drill head is positioned at an angle with respect to said path.

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