July 8, 1969 S. VEZIRAKIS 3,454,440

METHOD OF AND APPARATUS FOR FORMING THUMB RECEPTACLES IN BOWLING BALLS

Filed Oct. 22, 1965

Fig- 1

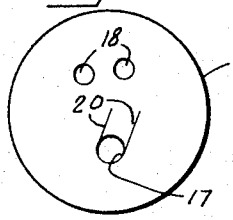


Fig- 2

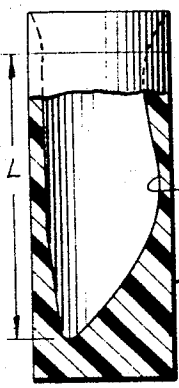


Fig- 5

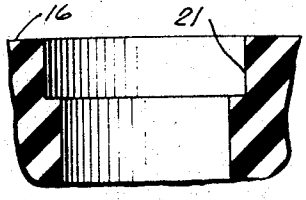


Fig- 7

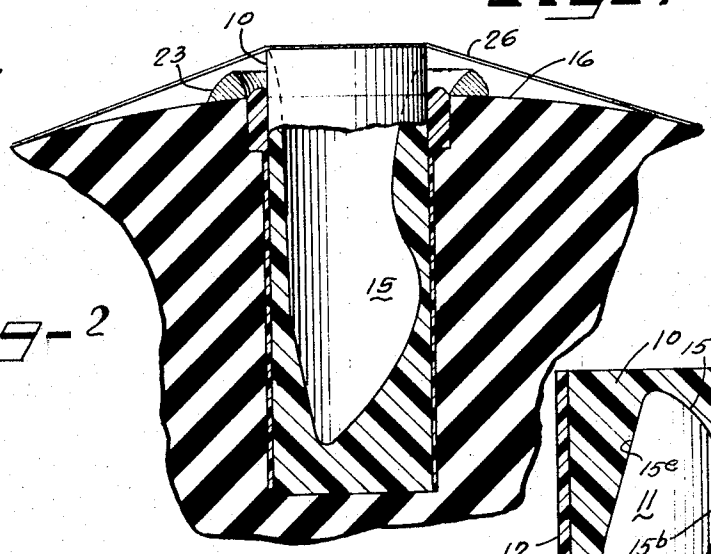


Fig- 3

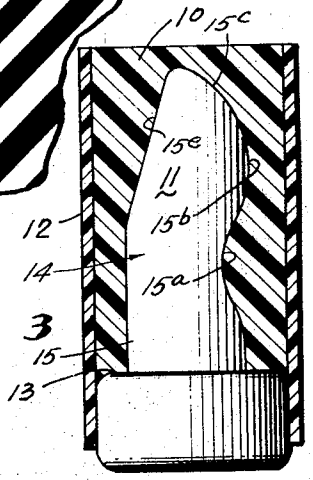


Fig- 6

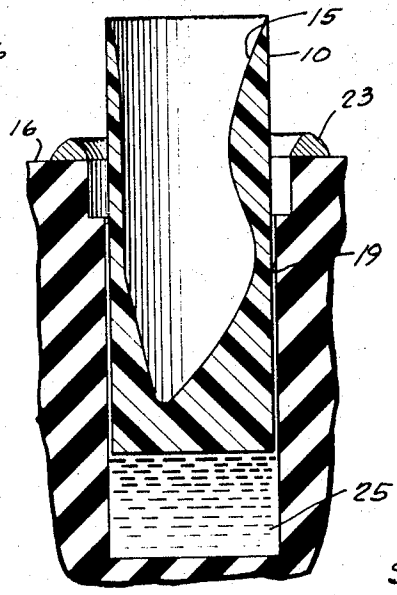


Fig- 4

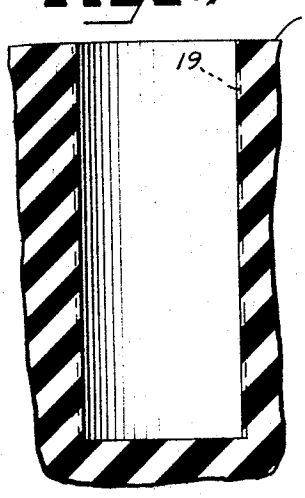
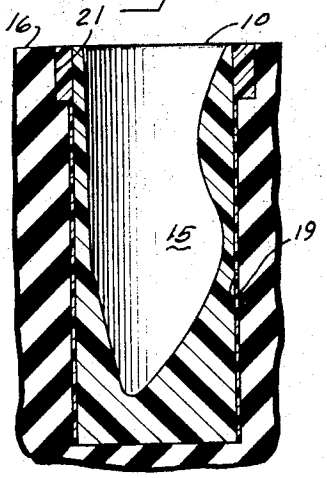


Fig- 8



INVENTOR.

STEVE VEZIRAKIS

BY Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

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1

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METHOD OF AND APPARATUS FOR FORMING THUMB RECEPTACLES IN BOWLING BALLS

Steve Vezirakis, Covina, Calif., assignor, by mesne assignments, to Starmaster Trophies, Inc., Portland, Oreg., a corporation of Oregon

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U.S. Cl. 156—242 7 Claims

ABSTRACT OF THE DISCLOSURE

Finger holes are formed in bowling balls to conform to the fingers of the bowler, by utilizing a cylindrical open ended mold for molding compound, and closing one end of the mold by a pliable pattern extending along the mold and conforming to the finger of the bowler. The molding compound is then poured into the mold and upon hardening forms a finger hole receptacle. The mold is removed by grasping the head of the pattern by the hand until it is smaller than the narrow portion of the finger cavity formed by the molding compound and drawn from the hardened molding compound. The preformed finger receptacle is then inserted in an oversize hole in a bowling ball and centered and aligned with respect to the hole and bonded to the bowling ball by the use of a plugging compound.

Background of the invention

Bowling balls have heretofore been drilled to form finger grips for the bowler, the finger holes being sized and spaced to receive the thumb, middle finger and ring finger of the bowler and to comfortably fit the spread of the bowler's fingers.

The balls many times are not drilled for the hand of a particular bowler and where the bowler does not have his own ball, he will select a ball in which the hole size and spread approximates the hand of the bowler.

It is, however, difficult to obtain the exact fit, even where the ball is drilled, for the fingers of the bowler and the finger holes are frequently too tight or too loose and are cylindrical throughout their length and do not provide sufficient gripping surface to give the average bowler the required control of the ball.

This has been remedied by molding the finger holes of the bowling ball to conform to the fingers of the bowler to increase the finger gripping action on the ball, with the resultant added comfort to the bowler and increased control of the ball as in my prior application Ser. No. 409,771 filed Nov. 9, 1964 and now Patent No. 3,316,588, dated May 2, 1967.

In my said prior application Ser. No. 409,771 now United States Patent No. 3,316,588 a pattern is inserted in a plastic material, such as a plugging compound poured in an oversized hole in the bowling ball to mold permanent finger holes in the ball conforming to the fingers of the bowler.

In the method of my present application, finger receptacles having interior walls conforming to the fingers of the bowler are first molded when outside of the ball and then inserted in plugging compound in oversize holes in the ball and retained in place until hardened.

While both methods of forming finger holes in bowling balls have proved to be very satisfactory, the present

2

method is more readily adaptable for small shops and for individual bowlers.

Objects of the invention

It is, accordingly, a principal object of the present invention to provide a new and improved method of forming finger holes in bowling balls conforming to the forms of the fingers of the bowler, by inserting in the ball finger receptacles tailored to the fingers of the individual bowler using the ball, and by retaining the receptacle in the ball by means of an adhesive plastic compound, which subsequently hardens to permanently bond the receptacle in the ball.

Another object of the invention is to provide a new and improved method of conforming the thumb hole in a bowling ball to the general form and size of the thumb of the bowler, by providing a thumb receptacle tailored to the thumb of the bowler and by bonding the thumb receptacle to an enlarged thumb hole in the bowling ball.

Still another object of the invention is to improve upon the bowling balls heretofore in use by molding individual receptacles conforming to the fingers of the bowler and having generally cylindrical exterior walls, by locating these receptacles at the proper angles for the fingers of the bowler and bonding the receptacle so located to oversized holes in the bowling ball.

Still another object of the invention is to provide an improved method of forming the finger holes in bowling balls to conform to the fingers of the bowler, in which finger receptacles are molded from a compound different from the material from which the ball is made, but which will bond to the ball, and are placed in oversized finger holes in the bowling ball and bonded thereto by a conventional form of compound commonly used to repair bowling balls.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

FIGURE 1 is a generally diagrammatic view of a bowling ball;

FIGURE 2 is a sectional view of a finger receptacle constructed in accordance with the principles of the present invention with the upper part of the receptacle shown in elevation;

FIGURE 3 is a cross sectional view of a container for a plastic molding compound showing a pattern in the container in solid and illustrating the operation of molding the receptacle shown in FIGURE 2;

FIGURE 4 is a cross sectional view taken through a fragment of a bowling ball through the thumb hole thereof and showing the oversize hole to be drilled in the ball in dotted line, in order to show a step in the method of the invention;

FIGURE 5 is a fragmentary cross sectional view of a bowling ball taken through the thumb hole of the ball showing the opening in the hole enlarged to trim the previous hole in the ball;

FIGURE 6 is a partial fragmentary cross sectional view taken through the thumb hole of a bowling ball illustrating a further step in inserting the receptacle in the thumb hole of a bowling ball;

FIGURE 7 is a cross sectional view taken through the thumb hole of a bowling ball illustrating a still further step in the operation of bonding the receptacle to the thumb hole of a bowling ball; and

FIGURE 8 is a partial fragmentary cross sectional view taken through the thumb hole of a bowling ball showing the receptacle bonded in position in the hole and trimmed flush with the periphery of the ball.

In the embodiment of the invention illustrated in the drawings, I have shown in FIGURE 2 a thumb receptacle or insert **10** which is adapted to be bonded to the thumb hole of a bowling ball in accordance with the principles of the present invention, to form a gripping receptacle in the ball, conforming substantially to the thumb of the individual bowler. The receptacle **10** may be made from a conventional compound, such as is commonly used to plug the holes in bowling balls. A common compound is an epoxy compound which rigidifies upon setting and is known to the bowling ball repair trade as "Ball Plug." Another suitable compound which may be used is a similar epoxy compound known to the trade as "Ball Mate."

The receptacle **10** may be molded by placing a pattern **11** within an open cylindrical retainer or mold **12**, with an enlarged head **13** of the pattern plugging the bottom of the retainer or mold and retaining the molding compound thereto to form the thumb receptacle or insert **10**.

The pattern **11** may be made to conform to the finger of the individual bowler and is preferably made from a flexible material which will stretch or contract and reduce in cross sectional area upon the exertion of a pulling force thereon. The pattern **11** may be like the pattern shown and described in my before mentioned application Ser. No. 409,771 filed Nov. 9, 1964, now United States Patent No. 3,316,588 and entitled "Pliable Molding Tool" and as shown in FIGURE 3 of the drawings, the head **13** of the pattern is generally cylindrical and slightly larger than the inside diameter of the cylindrical mold **12**, to seal the bottom of said mold when the pattern and head moves into the mold. The pattern **11** has a reduced diameter stem or finger portion **14** extending from the head **13** and generally conforming to the contour of the finger. The finger portion **14** has a reduced diameter generally cylindrical wall portion **15** extending from the head for a portion of the length of the pattern and has a shallow flat concave recess **15***a* on one side thereof locking the pattern to the molding compound upon hardening of the molding compound. A ridge **15***b* at the inner end of the recess converges into an inwardly curved convex portion **15***c* in the general form of the end of the finger behind the nail. The cylindrical wall portion also has an opposite flattened portion **15***e* generally simulating the nail portion of the thumb. While the pattern may be made from any suitable pliable or flexible material, a silicone rubber is a preferred material. When the molding compound poured about the pattern **11** hardens, which requires a period of from three to four hours, the pattern is removed by gripping the head **13** thereof and contracting the pattern to readily be withdrawn from the newly molded receptacle, and forming a receptacle having a thumb shaped cavity **15** therein.

A large number of receptacles **10** may be molded in this manner in various sizes and lengths and may be graduated into sixty-fourths of an inch to enable a receptacle to be selected in advance, which will fit the thumb of the individual bowler regardless of the size of the thumb of the bowler. The receptacles or inserts, however, may all be of approximately the same outside diameter.

In FIGURE 1, I have diagrammatically shown a bowling ball **16** having a thumb hole **17** and finger holes **18, 18.** The thumb and finger holes are drilled in a drill press by setting the ball in a fixture and drilling the holes to a required pitch, as determined by a gauge for the fixture and drill press (not shown). Where the gauge may be set to zero, for drilling a thumb hole, the hole is a radial hole and its center will intersect the center of the ball. The finger holes are usually drilled with a forward pitch, a three-eight inch forward pitch being a standard angle. With such a pitch the centers of the finger holes intersect

radial lines at distances of three-eighths inches from the center of the ball. The pitches of the thumb and finger holes, of course, may be reverse pitches as well as forward pitches, and may even be side pitches, in accordance with the size and shape of the bowlers hand, and the grip required to provide a perfectly balanced grip of the bowler on the ball.

In determining the angle of insertion of the receptacle in the thumb hole of a bowling ball, the bowler is given a predrilled ball. The bowler's thumb may then be inserted in the thumb hole of the ball and slowly drawn out of the thumb hole, to determined the angle at which the bowler has a balanced grip on the ball. This angle of the thumb hole will usually angle to the bowler's palm or ring finger. Two parallel lines **20, 20** may be then drawn on the surface of a ball as a visual guide, to determine the angle at which the receptacle is to be inserted.

Upon the selection of a receptacle of the proper size and determining the angle at which the receptacle is to be inserted, the length of the bowler's thumb is measured from the bottom of the cavity of the insert and this length is marked on the outside of the insert to determine the depth at which the insert is to be inserted in the bowling ball and the depth of the thumb hole to be drilled in the ball.

The ball **16** may then be centered on the drill press with the same size bit as the diameter of the receptacle that is to be installed in the ball. With the ball centered and the angle of the drill with respect to the ball located to give the proper pitch to the thumb hole, the ball may then be clamped on its ball hloder (not shown) to solidly position the ball with respect to the drill press.

Upon centering the ball and drilling a centering hole therein of the size of the receptacle, the centering bit is then removed and a larger bit larger in diameter than the outside diameter of the receptacle is placed in the chuck and the hole is redrilled to this larger diameter to the desired depth marked on the insert, as designated by the broken lines indicated by reference character **19** on FIGURE 4.

All existing round edges or bevels around the hole of the ball may then be cut out. In order to do this a counterdrill hole **21** of an enlarged diameter than the previously drilled hole, may preferably be drilled in the ball in centered relation with respect to the previously drilled hole and for a short portion of the depth thereof. This counterdrill not only cuts out all previous round edges or bevels around the thumb hole of the ball but also provides room for pouring a bonding compound, for bonding the receptacle to the ball, into the drilled hole.

A plugging clay indicated by reference character **23** may then be placed around the counterdrilled hole in the ball (FIGURE 6) in accordance with conventional practice in plugging the hole of a bowling ball.

The hole may then be filled with a plugging compound about one-fourth full, as indicated by reference character **25** in FIGURE 6. This material may be the same compound from which the receptacle is molded and may preferably be a material known to the trade as "Ball Plug," although other commercial materials may be used with satisfactory results.

With the hole partially filled with plugging compound, the insert **10** may then be placed in the hole in the bowling ball at the proper angle, by following the previously made guide marks **20** on the outside of the ball, indicating the pitch angle of the receptacle or insert. The receptacle may then be inserted all the way to the bottom of the ball, so as to assure a thumb hole of the proper length. This also eliminates air pockets at the bottom of the hole.

If the plugging compound should not entirely fill the hole, additional compound may be poured in the hole to entirely fill the hole and permanently hold the receptacle in place.

With the receptacle inserted in the thumb hole at the proper angle, to the bottom of the hole, and the thumb

hole completely filled with compound, a piece of masking tape **26** may be placed over the top of the insert and adhesively secured to the surface of the ball on opposite sides of the receptacle, to assure a steady position of the insert and to prevent the insert from raising up from the bottom of the hole.

The plugging compound may then be allowed to harden which requires a period of from three to four hours at room temperature.

Upon the hardening of the plugging compound, the plugging clay, excess plugging material and receptacle may be removed from the ball to bring the level of the insert or receptacle flush with the top of the ball. The hole in the receptacle may then be beveled if desired by the use of a file and sander and the beveled area may be finished with fine emery paper and then rubbed by the use of rubbing compound or jewelers rouge.

A thumb hole has thus been provided in a bowling ball generally conforming to the thumb of a bowler and pitched at the proper angle to enable balancing of the ball upon release from the thumb of the bowler. If desired, finger receptacles may be mounted in the bowling ball in the same manner as the thumb receptacle, although it has been found that where the thumb hole is proper and fits the thumb of the bowler and is at the proper pitch, that it is not usually necessary to conform the finger holes to the fingers of the bowler, where the finger holes are properly spaced and pitched.

The thumb hole forms an integral part of the ball, being bonded thereto by the plugging compound, and cannot be distinguished from the material from which the ball is made upon proper finish of the ball.

While I have herein shown and described one form in which the invention may be embodied, it may be understood that various variations and modifications in the invention may be attained without departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:

1. A method of forming a thumb hole in a bowling ball comprising the steps of:

providing a finger receptacle having a cavity therein formed to generally conform to the finger of an individual bowler,

centering the ball by drilling a hole in the ball of the diameter of the outside diameter of the receptacle at a selected release angle with respect to the axis of the ball,

enlarging the initial hole by drilling a hole in the ball of a arger diameter than the diemeter of the finger insert and coaxial with the axis of the first hole and drilled to a depth determined by the length of the thumb of the bowler,

filling the hole with a plugging compound for a portion of the depth thereof,

inserting the receptacle into the hole and the plugging compound therein, to the bottom of the hole,

then allowing the plugging compound to harden and cleaning excess plugging compound and the projecting part of the insert from the hole.

2. A method of forming a finger hole in a bowling ball comprising the steps of:

providing a finger receptacle having a cavity generally conforming to the thumb of the bowler,

determining the release angle of the thumb of the bowler,

marking this angle on the surface of the ball,

marking the length of the bowlers thumb from the bottom of the receptacle on the outside wall of the receptacle,

centering the ball by drilling a hole in the ball, of the diameter of the receptacle, at the proper release angle for the bowler,

enlarging the centering hole by drilling a coaxial hole of a larger diameter than the outside diameter of the insert,

partially filling the hole with plugging compound,

placing plugging clay around the hole,

placing the receptace in the hole to the bottom thereof,

and retaining the receptacle in position in the hole unil hardening of the plugging compound and then cleaning excess compound and the projecting end portion of the receptacle flush with the surface of the ball.

3. A method of forming a finger hole in a bowling ball in accordance with claim **2**,

wherein the receptacle is retained to the hole until hardening of the plugging compound by placing adhesive tape over the top of the receptacle and adhesively secured to the surface of the ball.

4. A method of forming a finger hole in a bowling ball in accordance with claim **3**,

wherein the receptacle is molded from an epoxy compound and the plugging compound is a compound similar to the compound forming the receptacle.

5. A method of forming a finger hole in a bowling ball comprising the steps of:

providing a finger receptacle having a cavity generally conforming to the thumb of a bowler and longer than the thumb of the bowler,

determining the release angle of the thumb of the bowler and marking this angle on the surface of the ball,

marking the length of the thumb on the receptacle measured from the bottom of the receptacle toward the open end thereof,

centering the ball on a drilling fixture,

drilling a hole in the ball of the diameter of the outside diameter of the receptacle at the release angle marked on the ball,

enlarging the previously drilled hole by drilling, and drilling to a depth equal to the length of the thumb of the bowler,

trimming and enlarging the hole at the entering end thereof by drilling an enlarged diameter counterdrilled hole for a short portion of the length of the drilled hole,

placing plugging clay around the hole,

partially filling the hole with plugging compound,

placing the receptacle in the hole to the bottom thereof at the proper angle determined by the release angle guide lines marked on the surface of the ball,

taping the receptacle to the ball by placing adhesive tape over the top thereof and then cleaning the portion of the receptacle and plugging compound projecting above the surface of the ball flush with the surface of the ball.

6. A method of forming a finger hole in a bowling ball in accordance with claim **5**,

wherein the receptacle and plugging compound are an epoxy resin compound.

7. An apparatus for forming preformed finger hole receptacles for bowling balls for bonding to a predrilled hole in a bowling ball, said apparatus being in combination with

an elongated open ended cylindrical mold longer than the length of the finger,

a pliable finger pattern having a generally cylindrical head conforming to and sealing an end of said mold, and having

a body portion extending from said head conforming generally to the form of the finger,

said body portion including a reduced diameter generally cylindrical wall portion extending from said head for a portion of the length of said pattern and having

a shallow flat concave recess on one side thereof, locking the pattern to the molding compound upon hardening of the molding compound poured into said mold,

a ridge at the inner end of said recess, converging toward the opposite end of said pattern from said head into a flattened inwardly curved convex portion in the general form of the end of the finger behind the nail,

said cylindrical wall portion having an opposite flattened portion generally simulating the nail portion of the finger,

and said head besides forming a seal for the bottom end of the mold being adapted to be gripped by the hand to stretch and unlock the pattern for removal from its mold.

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HAROLD ANSHER, *Primary Examiner.*

U.S. Cl. X.R.

18—5.1; 156—98, 252, 293; 273—64