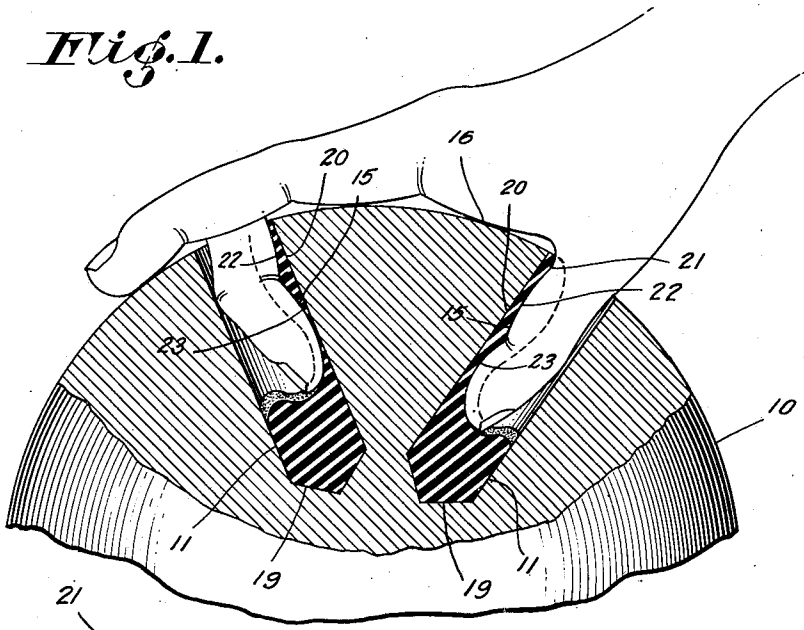
Sept. 20, 1949. H. J. KRAMER 2,482,190

FINGER HOLE INSERT FOR BOWLING BALLS

Filed Feb. 19, 1945

Fig. 1.



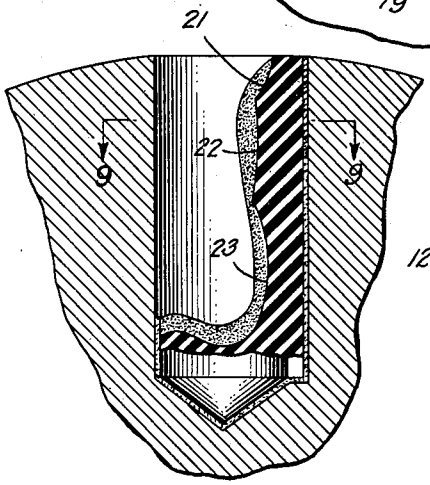


Fig. 8.

Fig. 2.

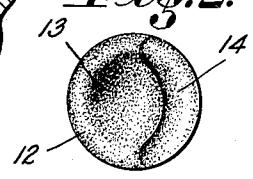


Fig. 4.

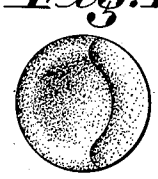


Fig. 6.

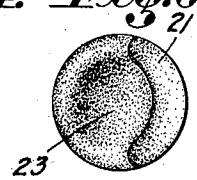


Fig. 3.

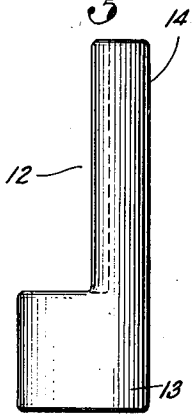


Fig. 5

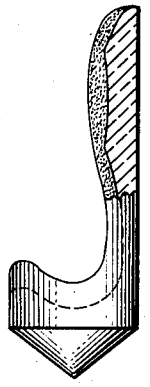
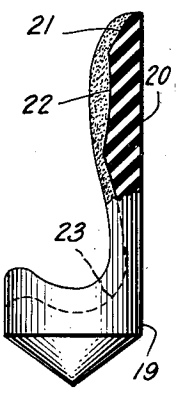


Fig. 7.



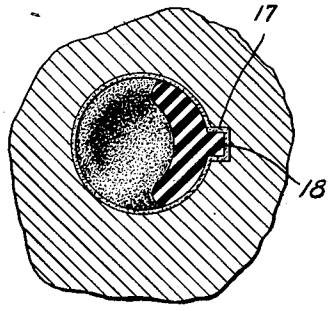


Fig. 9.

Inventor
Herman J. Kramer
By T. V. Quarnstrom
Attorney

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2,482,190

FINGER HOLE INSERT FOR BOWLING BALLS

Herman J. Kramer, Cleveland, Ohio, assignor of one-half to Eugene J. Reardon

Application February 19, 1945, Serial No. 578,571

16 Claims. (Cl. 273—63)

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This invention relates to a bowling ball having finger holes and more particularly to an improved finger gripping means for the finger holes thereof.

The usual bowling ball is provided with two or more holes one for the thumb and the other holes for other fingers of the hand. These holes are provided so that the ball may be held in one hand of the player when bowling and so that the ball while in motion in the player's hand may be controlled by the player until released at the proper time for delivery. These holes are all drilled, whether radially or convergingly to a point above the ball center to provide a sufficient angle so that the player's fingers can grip, retain and control the ball.

For the sake of safety, comfort, consistency in playing and good scoring it is desirable that the holes provided in the ball properly fit the player's hand and fingers. The fit around the thumb should be just loose enough for comfort and tight enough to maintain friction or grip when the thumb is bent at the joint and pulled out of the hole upon delivery of the ball. The holes for the other fingers should fit with the same degree of looseness. When the holes are too large it is difficult to hold the ball properly; when too small, the fingers of the player soon become irritated, torn and scraped because the fingers have a tendency to expand after a few balls have been rolled. Tight or small finger holes prevent the release of the ball correctly and easily. They cause the ball to cling to the fingers too long at the time of delivery, thus either reversing or hooking the ball unnaturally.

In order to eliminate the tendency for the ball to slip out of the player's hands prematurely various expediences have been resorted to such as the use of chalk and other sticky materials, and by providing liners for the holes made of compressible and yieldable material such as cork, soft rubber or other resilient material. It has also been suggested to corrugate the inside surfaces of the holes, to otherwise roughen the wall surfaces thereof, and to provide inserted hard liners having rough areas all to provide frictional gripping means. While these suggestions have provided a certain degree of friction for gripping purposes they have also presented the undesired friction that has resulted in abrasion and soreness of the fingers. In an attempt to overcome these difficulties it has been suggested to provide a wall structure for the holes in which effective finger gripping was made possible while the friction was either minimized or eliminated,

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this having been accomplished by forming the holes so that the entrant end region was hard, smooth and frictionless and the wall at the inner region was compressible and resilient.

While these suggestions have been partially successful they have failed to provide the desired gripping action of the fingers in the holes of the ball, they have failed to provide during extended periods of playing time the necessary smoothness and frictionless passage to the withdrawing fingers of the player when playing, and they have failed to provide the exacting fit for the players hand and fingers desirable for the safety, and comfort of the player as well as to effect consistency in playing and good scoring.

Nature has provided the skin on the inner surface of the hands and fingers with numerous ridges and depressions arranged in various patterns and on the tops of the ridges are located the outlets or mouths of small ducts which permit the discharge of moisture onto the hands and fingers. These patterned ridges and depressions give the fingers a fine sense of touch and also provide a suction between the surface of the fingers and the article contacted to thereby enable the hands and fingers to more securely grip the article when it is held in the hand.

It is customary when holding a ball with finger holes in playing to insert the fingers into the holes so that the 3rd and 2nd and in some cases a portion of the 1st phalanges of the fingers are in the holes. In thus inserting the fingers in the application of my invention I take full advantage of nature's provision of suction created by the alternate ridges and depressions in the surface of the skin of the player's fingers for holding the ball by providing inserts for the finger holes, of the ball made of material which is non-deformable at temperatures to which the ball may be subjected in playing and having the surface to be contacted by the player's fingers formed with a contour conforming to the shape of the individual fingers of the player. Thus each portion of the player's fingers is afforded an opportunity of serving the function which nature has provided thereby distributing the weight and force resulting from the momentum of the moving ball uniformly to all the surface portions of the player's fingers which are gripping the ball thereby affording greater ease in playing and controlling the movement of the sphere as it is released, and at the same time providing a smoothness and frictionless passage to the withdrawing fingers which will result in

a minimum wear and tear of the skin of the fingers over extended periods of playing time.

It is one of the objects of my invention to provide inserts for the holes of a bowling ball that are not only smooth and frictionless for the passage of the withdrawing fingers when the ball is released but which also will provide the proper fit for the fingers of the player.

It is another object of the invention to provide an individualized grip for a bowling ball.

It is a still further object of the invention to provide individualized grip inserts for application in the holes of any standard bowling ball in common use.

To the accomplishment of the foregoing and such other objects as may hereinafter appear, the invention further consists in the structural combinations hereinafter sought to be defined in the claims and described more in detail hereinbelow in connection with the appended drawing, in which:

Fig. 1 is a view of a portion of a bowling ball partly shown in section and disclosing the improved finger hole gripping means of my present invention and the manner of its use.

Fig. 2 is a plan view of a blank used in making the pattern of the individualized finger grip insert of the invention.

Fig. 3 is a side view of the blank shown in Fig. 2.

Fig. 4 is a plan view of the pattern used in making the individualized finger grip insert of the invention.

Fig. 5 is a side view of the pattern shown in Fig. 4.

Fig. 6 is a plan view of the individualized finger grip insert of the invention.

Fig. 7 is a side view of the individualized finger grip insert shown in Fig. 6.

Fig. 8 is an enlarged view of a portion of a bowling ball partly shown in section and disclosing one of the finger holes shown in Fig. 1 with one of the individualized finger grip inserts shown cemented in place in the finger hole thereof.

Fig. 9 is a cross-sectional view taken on line 9—9 of Fig. 8.

Referring now more in detail to the drawing, the bowling ball embodying my invention comprises the usual bowling ball 10 customarily made of hard rubber or a synthetic resin and provided with bored or drilled finger holes 11 arranged convergingly as shown to present a sufficient angle so that the player's fingers may grip, retain and control the ball. While only two holes are shown drilled in the bowling ball, three or more holes may be provided as desired by the player.

To accomplish the object of the invention, one or more of the holes 11 is provided with a finger contacting wall surface so designed that effective finger gripping is made possible whereby the player's fingers will be able to properly grip, retain and control the ball.

In forming the finger contacting wall surfaces of the finger holes, patterns of the player's fingers are first made having the finger contacting surfaces formed with the same contour as the surfaces of the individual fingers of the player. A mold of the pattern may thereafter be made in suitable molding material into which may be cast a finished insert.

To make the pattern a plug 12 is provided made preferably of soft wax and formed by heating to a shape somewhat as shown in Fig. 3 having a cylindrical portion 13 and an extended arcuate shank 14 of a size that will fit into one of the finger holes 11 so as to extend from the bottom of the hole to the surface of the ball. With a form of blank as shown in Figs. 2 and 3 a pattern and cast of the same can be made which will provide a bottom to fit the end of each of the fingers of the player which is inserted in the finger hole of the ball and a shank which will occupy substantially only that portion of the finger hole which will be contacted by the inside surface of each of the player's fingers thus leaving the remainder of the cylindrical portion of the hole free to afford the necessary looseness to prevent the player's fingers from sticking in the holes upon delivery of the ball when playing. The wax plug is preferably a type of wax which may be readily softened by heating without becoming flaky or laminated. The wax should also preferably be a type which is sufficiently plastic at temperatures slightly above the temperature of the finger which is inserted into the finger hole to form the wax into a pattern. The wax should not be adhesive but sufficiently cohesive and capable of hardening after it is formed so that it can be removed from the finger hole without distortion. A suitable wax may contain one or more of the following ingredients: paraffin, beeswax, carnauba, ceresin, dammar resin (gum dammar), and stearin. The following wax formula has been found satisfactory:

	Per cent
Carnauba	25
Ceresin	10
Paraffin	60
Beeswax	5

While soft wax has been specifically described other types of yieldable material having similar characteristics may be used with equally satisfactory results such as plastics particularly synthetic resins.

In forming the pattern for the insert the hole 11 is first lubricated so as to permit the pattern to be readily removed after it has been formed, after which the wax plug is softened slightly by heating and is inserted into the lubricated hole so that the shank portion 14 will be positioned adjacent the side 15 thereof as indicated in Fig. 1. Thereupon one of the fingers, the contour of which is to be formed in the wax is inserted in the hole 11 in the position in which the ball is to be gripped when playing and the ball is gripped so as to press the finger into the soft wax of the plug thereby forming an impression in the wax having the contour of the end and inside surface of the player's finger and squeezing the excess wax from the hole. The formed wax pattern is then removed from the hole and any excess wax is trimmed from the pattern. If desired the wax pattern may be softened by reheating and may be inserted again into the finger hole whereupon the player may again grip the ball and swing it as he would when playing to thereby form a better and more accurate impression of the finger. The formed wax may if preferred be removed and reheated a third time to soften and be inserted in the lubricated hole a third time and may be further compressed by inserting the finger in the hole, and by again gripping and swinging the ball and releasing it in the act of playing. While the forming of the pattern for only one finger hole has been described, similar patterns may be made for the other finger holes preferably at the same time so that surface contours will be formed in the patterns with the fingers inserted fully into

the finger holes so that when the ball is lifted and swung by the player there will be substantially no open space between the portion 16 of the players hand and the surface of the ball as shown in Fig. 1. By thus fitting the fingers in the pattern in the finger holes with the hand touching the surface of the ball practically no variation in the pitch or span of the player's hand will be possible. With the ball thus fitted to the hand the player will be able to grip and hold the ball without prematurely dropping it and a smooth delivery with perfect control of the ball will result.

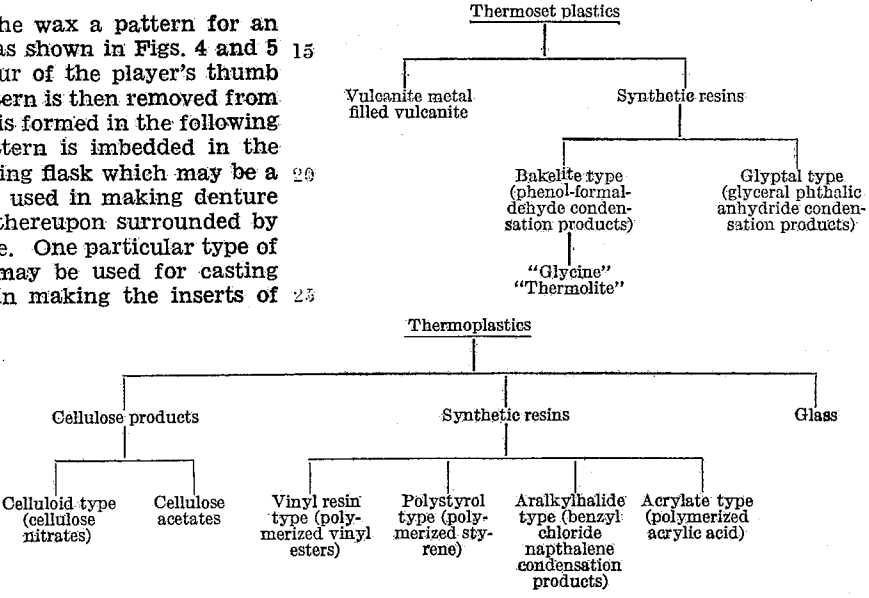
After thus forming the wax a pattern for an insert will be obtained as shown in Figs. 4 and 5 having the exact contour of the player's thumb or finger. The wax pattern is then removed from the holes and an insert is formed in the following manner. The wax pattern is imbedded in the lower half of a vulcanizing flask which may be a type such as commonly used in making denture base materials, and is thereupon surrounded by plaster or artificial stone. One particular type of artificial stone which may be used for casting such as contemplated in making the inserts of my invention is known as quick setting stone and may have the following approximate analysis:

	Per cent
Sodium potassium tartrate	1 to 5
Sodium citrate (retarder)	0.10
Pigment	1.50
Plaster	Remainder

Other casting stones may also be used such as anhydrite stone which is formed by calcining gypsum and plaster-cement stones, which are plaster mixed with alum, sand, cement, and citric acid. A separating medium is applied on the plaster and the wax pattern in the lower half of the flask. After the plaster has hardened then the upper half of the flask is placed in position above the lower half, and filled with plaster or stone. After the final set of the plaster material has occurred the halves are separated, and the wax is melted and flushed out with hot water leaving a mold of the desired insert. This mold cavity is then packed with the material which is to be used in making the required insert after which the packed material is vulcanized or cured by the application of heat or heat and pressure depending upon the type of material used.

In forming the finger hole inserts according to the invention I preferably use plastic material which may be either a thermoset or thermoplastic type. Thermoset plastics are those substances which change chemically while being subjected to heat. Thermoset resins are those which although softened by the initial application of heat are permanently hardened by continued heating and are thereafter no longer capable of being softened by reheating. Thermoset plastic bases are placed in the mold in a plastic or granular state. Very little pressure is used to effect closure of the flask

and heat is then applied to cure the materials. Thermoplastics are those substances which soften under heat and mold into form under pressure. The thermoplastic bases are heated to render them plastic and are then forced into shape by means of pressure applied in a suitable press. Thermoplastic resins may be repeatedly softened by heating and hardened by cooling without undergoing a chemical change. Some of the plastics of the above two types which will be suitable for forming the fingerhole inserts of the invention are as follows:



The various types of plastics mentioned have been listed as some examples of material suitable for making the inserts of the invention and are not to be construed as limitations as in addition to these resins there are a number of other products that have excellent properties that make them suitable for use in making the inserts. Urea-formaldehyde and styrol compounds have many desirable qualities as well as the polyindine compounds. The petroleum resins may also be used. It is desirable in a plastic to be used as an insert of the invention that it be chemically stable at the temperatures at which it is moldable. It is also a requisite of the plastic that in the vulcanized or cured state it be hard, strong, tough, durable, physically and chemically stable and be insoluble in water and in perspiration from the player's hand and fingers. Also it should take and retain a polish.

The surface hardness of the thermoset plastics contemplated as coming within the scope of the invention may vary from 13 to 27 kilograms per square millimeter as measured by the Knoop indentation method and the impact strength may vary from 2 to 43 centimeter-kilograms per cubic centimeter. The surface hardness of the thermoplastic materials suitable for use in the invention may vary from 10 to 22 kilograms per square millimeter as measured by the same method and the impact strength of such materials may vary from 8 to 109 centimeter-kilograms per cubic centimeter.

The containers in which the models or patterns are imbedded, and to which repeated reference has already been made, are called flasks. These are made in various shapes and types; some have bolts to hold the flask parts together during vulcanization, others have the parts held together

by spring clamps or a compress. A bench press is used in closing the flasks after they are filled with the molding plaster, and also when the rubber or other material to be vulcanized or cured is subjected to heating.

I have successfully used in making inserts according to the invention vulcanite also known as ebonite or hard rubber which is a thermoset material and which is fabricated by the chemical reaction between sulfur and rubber. One form of vulcanite in common use which is applicable in making an insert of the invention has the following analysis:

	Per cent
Raw rubber	62
Sulfur	29
Inert material	9

If desired I may form the insert with vulcanite having a condensite facing.

This material may then be cast to form the insert by packing in a conventional mold and vulcanized by the application of heat. After packing and vulcanizing the inserts are then finished by polishing or otherwise so as to accurately fit into the finger holes. When finished the inserts are placed in the finger holes of the ball and after they have been placed in the exact position determined by inserting the thumb and fingers into the holes the inserts are then permanently cemented in place. If desired a vertical slot 17 may be provided in the finger holes and the wax patterns and cast inserts formed with tongues 18 to fit the same so that when the finished inserts are placed in the finger holes they will be positioned to fit the player's fingers when playing. Figs. 6 and 7 show plan and side views, the latter partly in cross section of the cast insert before it is cemented in place in the finger hole of a ball. Thus finished inserts are formed and secured into playing position in the finger holes 11 of the ball as shown in Fig. 1 having bottom portions 19 and shank portions 20 conforming to the shape of the finger holes 11 and individualized surface portions 21, 22 and 23 conforming to the surface contours of the 1st, 2nd and 3rd phalanges respectively of the player's fingers inserted into the finger holes when playing the ball. Due to the fact that no two persons have fingers of exactly the same shape and with the same impressions every insert made and used according to my invention will have a different finger contacting surface than every other insert. In other words every insert will be custom built in the sense that it will be made or done to order as custom clothes or custom work. These inserts, if made of plastic material, will have when cured a hardness to maintain the shape of the inserts as cast including the individualized surfaces of the inserts and these surfaces will be maintained until they become worn in use and have to be replaced or repaired.

While the inserts of the invention have been described as secured permanently in place I may if preferred secure them in the finger holes by means of a cement which can be softened by the application of a little heat so that they can be removed and later secured in the finger holes of other balls which will preferably have the finger holes drilled so as to fit the span of the player's hand Other means for securing the inserts in the finger holes, either with or without cement, may also be used, such as, threads in the holes and on the inserts, or spring-actuated bayonet type connections both of which are well known constructions and need no further descriptions.

I may use other types of rubber compounds which would be processed and cast into molds to form inserts and be vulcanized in much the same manner as vulcanite. Such other rubber compounds applicable in carrying out the invention are olive base rubber, metal filled rubber, maroon rubber, pink veneer rubber, and pink rubber.

In the application of the phenol-formaldehyde condensation product type of resin which is also a thermoset type of plastic to the invention I preferably use the intermediate products of the reactions of phenol and formaldehyde resin. If this mass is heated (approximately 140° C. for one-half hour) a solid mass results on cooling which may be used in sheet form, as a powder, or in a cake form. This material in sheet form is packed in a vulcanizing flask in the same manner as vulcanite and subsequently heated to form the completed resin insert. If the cake form is used it may be ground to a powder just before use.

After the wax is removed from the matrix or mold, and both halves of the flask are thoroughly cleaned, they are placed into a shallow pan of boiling water so as to heat the plaster mold. It takes from 15 to 20 minutes for the heat to penetrate the investment plaster.

The following description covering the procedure for manipulating and curing the phenol-formaldehyde resins can with certain modifications be employed when using any of the thermoset resins belonging to this particular group of synthetic compounds.

While the flask halves are heating, the material when a cake form is used is ground in an unglazed mortar by a pestle to the fineness of coarse salt. After the matrix or mold has been properly heated it is flushed with acetone, drained and dried by wiping with cotton or cloth. While the matrix or mold is still warm some of the resin is poured from a spoon into the mold and spread and packed in. The heat of the mold causes the resin to fuse quickly and it should be immediately compressed by pressing and tamping with a packing instrument. Additional resin is added and condensed by repeated tamping. Considerable force can now be used without danger. When the walls of the mold are covered to the desired depth and thickness, the resin is again tamped until the entire mass is melted or fused.

The cast portion of the mold is now taken from the boiling water and similarly packed with resin a sufficient amount being used to insure the filling of the mold. Both sides of the pack must be thoroughly melted. The two flasks are brought together and placed in a compress or hand press and slowly closed. Any excess resin used will escape during the closure of the flask or during the early stages of the cure when it becomes highly fluid.

In the application of the thermo-plastics to the invention I may use some of the cellulose products such as manufactured from wood or cotton fiber such as celluloid, composed of cellulose nitrates or the cellulose acetates. When using the cellulose nitrates camphor is employed as the plasticizer, and when using the cellulose acetates certain vegetable oils are employed as the plasticizers. Blanks of these materials may be used from which the insert is pressed on the cast under pressure and heat. The cellulose nitrate compound inserts are characterized by a lower tensile strength, lower proportional limit, larger

set and greater deflection when heated under pressure, and hence would probably be subject to greater distortion in use than the other plastic materials.

In the application of the synthetic resins to the invention I may use the vinyl resins which are the derivatives of ethylene polymerized to form resins such as polystyrene resin.

I may also use the polyvinyl copolymers namely the combination resin of polyvinyl acetate and polyvinyl chloride which have been copolymerized to the combined form. These copolymer resins are also thermoplastic in nature and the plasticity may be governed by the vinyl chloride-acetate ratio. In practice approximately 85 to 87 percent of monomeric vinyl chloride may be used.

In the further application of the synthetic resins to the invention I may use one or more of the acrylic resins which also are derivatives of ethylene although specifically polymers of acrylic acid, methacrylic acid or certain esters of these acids. Among these may be included methyl methacrylate resins which are extremely stable and have excellent aging properties, and polymethyl methacrylate resin. While these resins may be molded as thermoplastics they are generally furnished in powder form and are mixed with a liquid plasticizer in the proper proportions just before they are to be packed into the vulcanizing flask for curing. By classification, the resins are thermoset during the early stages of polymerization, but as the reaction progresses, a thermoplastic softening takes place. As the reaction continues the mass becomes more rigid until at the end of the cure a solid mass results, provided the curing temperature is below the softening point of the resin. The soft material is packed into a warm mold and the flask is closed under pressure. Curing can be accomplished either in boiling water or in a vulcanizer.

In processing inserts out of acrylic resins the same procedure of casting of the phenol-formaldehyde resins applies to these resins. This type of resin is put up in two different forms which will be described separately.

All claims made are to the effect that the material is stronger than vulcanite, that it possesses complete stability and does not warp. It adheres well to metals and is easy to pack in the mold and to process both in making new inserts and in repairs.

As supplied for use the material is fully cured. In one form it is made up in sheets and the methods for using them are fully described and illustrated in the instruction sheet accompanying each package of material.

The sheets may be packed in the conventional flask type mold to which heat and moderate pressure may be applied if desired to form the inserts, the heat being added merely to hasten the hardening of the inserts which, however, can be hardened at room temperature if allowed to remain in the closed flasks for several days. When cooled or hardened the inserts may be removed from the flasks and trimmed and polished like inserts of vulcanite or other resins.

The other form of acrylic resin which has been referred to is supplied in the form of a granular preparation and a liquid solvent. The same preparation of the mold is made and when the cast is ready to be packed the solvent is added to a desired amount of the granular material.

The mixture may be packed in the conventional flask type of mold which may then be hardened by the application of heat. After cooling the insert may be polished and finished in the same manner as other acrylic resins.

While only a general description of some methods and apparatus for casting the inserts of the invention out of plastic materials have been presented it is believed a sufficient description has been made to enable anyone skilled in the art to carry out the invention. If more detailed descriptions of any specific apparatus or vulcanizing or curing technique are desired complete descriptions thereof may be found in the "Complete Denture Prosthesis" by R. O. Schlosser, published in 1939.

It is also within the scope of the invention to form the inserts of either ferrous or non-ferrous metals and metal alloys. These may be made by casting or by swaging wrought metal into the desired form. Some such metals are cast aluminum, alloys of chromium, molybdenum and cobalt. For such metals casting temperatures well over 2200° F. are necessary and molding flasks and material such as used in conventional metal foundry practice must necessarily be used in casting the inserts. After the inserts have been cast they may preferably be sand or shot blasted to remove the surface roughness and subsequently ground and polished.

I may also form the inserts of stainless steel which may be swaged to the desired shape. Various metals such as non-ferrous metals may be deposited electrolytically directly to the surface of a cast or model of the insert thus giving an excellent adaptation. The metallic bases have the great advantage of high strength and wear resistance and are very sanitary. I may also overlay or coat especially the finger contacting surfaces of the metallic inserts with a non-metallic coating such as synthetic resin, or a porcelain or baked enamel.

The individualized finger grip for a bowling ball of my present invention, the manner of making the same, and the advantages in use will, in the main be fully apparent from the above-detailed description of the same. It will be further apparent that changes may be made in the construction thereof and in the arrangement of the parts, without departing from the principles of the invention as above set forth or as defined in the following claims.

I claim:

1. An elongated preformed insert for the finger hole of a bowling ball, said insert having a semi-cylindrical body portion with its outside surface adapted to fit the wall of the said finger hole and its inside surface provided with at least two adjacent curvilinearly concave portions arranged tandem and extending from one end of the insert, the two innermost of the said adjacent concave portions conforming respectively to the surface contours of the inside halves of the medial and distal phalanges of the player's finger which is inserted with the said insert in the said finger hole when playing the ball.

2. An elongated preformed insert for the finger hole of a bowling ball, said insert having a cylindrical end portion and a substantially semi-cylindrical shank portion longer than the said end portion, said insert having its outside surface adapted to fit the bottom and wall of the said finger hole and its inside surface provided with at least two adjacent curvilinearly concave portions arranged tandem and extending inwardly from the end of the insert opposite the cylindrical end portion, the two innermost of the said adjacent concave portions conforming respective-

ly to the surface contours of the inside halves of the medial and distal phalanges of the player's finger which is inserted with the said insert in the said finger hole when playing the ball, the inside surface of the innermost concave portion continuing curvilinearly into the said cylindrical end portion of the insert.

3. The article of claim 1 in which the insert is made of a plastic material.

4. The article of claim 1 in which the insert is made of a thermo-plastic material.

5. The article of claim 1 in which the insert is made of a thermo-plastic material having in the cured state a hardness greater than 9 kilograms per square millimeter as measured by the Knoop indentation method.

6. The article of claim 2 in which the insert is made of a plastic material.

7. The article of claim 2 in which the insert is made of a thermo-plastic material.

8. The article of claim 2 in which the insert is made of a thermo-plastic material having in the cured state a hardness greater than 9 kilograms per square millimeter as measured by the Knoop indentation method.

9. The article of claim 1 in which the insert is made of a thermo-set plastic material.

10. The article of claim 1 in which the insert is made of a thermo-set plastic material having in the cured state a hardness greater than 12 kilograms per square millimeter as measured by the Knoop indentation method.

11. The article of claim 2 in which the insert is made of a thermo-set plastic material.

12. The article of claim 2 in which the insert is made of a thermo-set plastic material having in the cured state a hardness greater than 12 kilograms per square millimeter as measured by the Knoop indentation method.

13. The article of claim 1 in which the insert is made of metal.

14. The article of claim 2 in which the insert is made of metal.

15. An elongated preformed insert for the finger hole of a bowling ball, said insert having an elongated body portion with its outside surface adapted to fit the wall of the said finger hole and its inside surface provided with at least two adjacent curvilinearly concave portions arranged tandem and extending from one end of the insert, the two innermost of the said adjacent concave portions conforming respectively to the surface contours of the inside halves of the medial and distal phalanges of the player's finger which is inserted with the said insert in the said finger hole when playing the ball.

16. An elongated preformed insert for the finger hole of a bowling ball having a slot therein, said insert having an elongated portion with its outside surface adapted to fit the wall of the said finger hole, said outside surface having a tongue portion extending outwardly therefrom and adapted to fit the slot in the finger hole of the ball and having its inside surface provided with at least two adjacent curvilinearly concave portions arranged tandem and extending from one end of the insert, the two innermost of the said adjacent concave portions conforming respectively to the surface contours of the inside halves of the medial and distal phalanges of the player's finger which is inserted with the said insert in the said finger hole when playing the ball.

HERMAN J. KRAMER.

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