

July 25, 1939.

F. O. GERMAN ET AL

2,166,950

GAME APPLIANCE AND METHOD OF MAKING

Filed Sept. 15, 1937

4 Sheets-Sheet 1

Fig. 1.

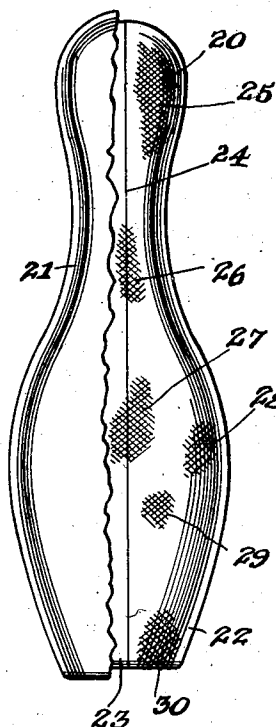


Fig. 2.

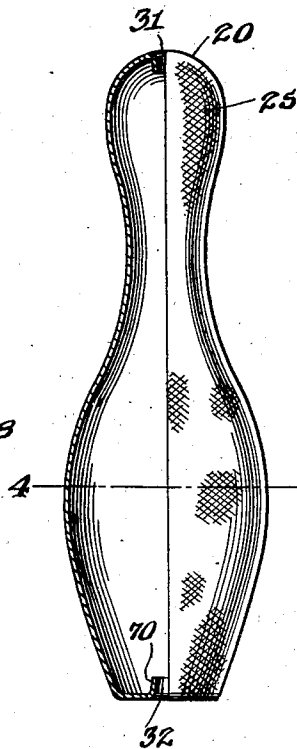


Fig. 3.

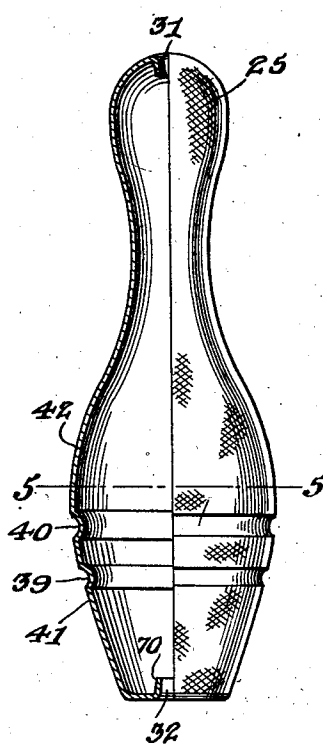


Fig. 4.

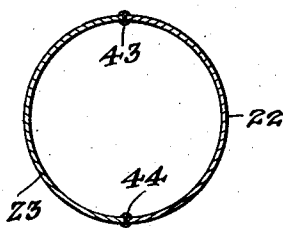
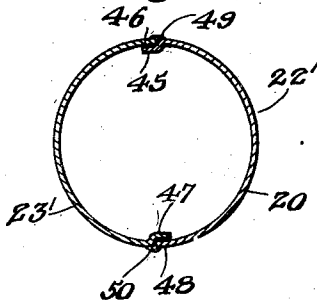


Fig. 5.



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Fig. 6.

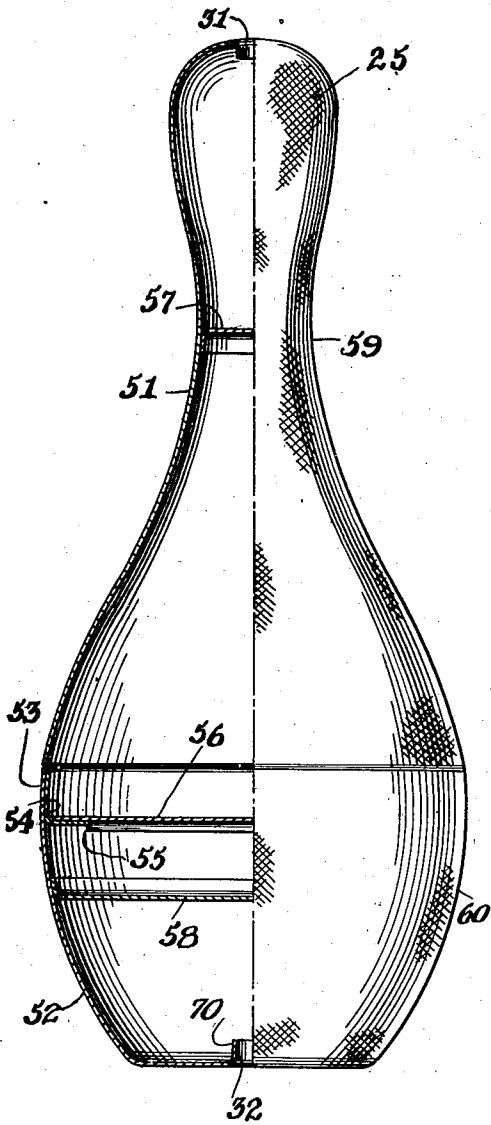
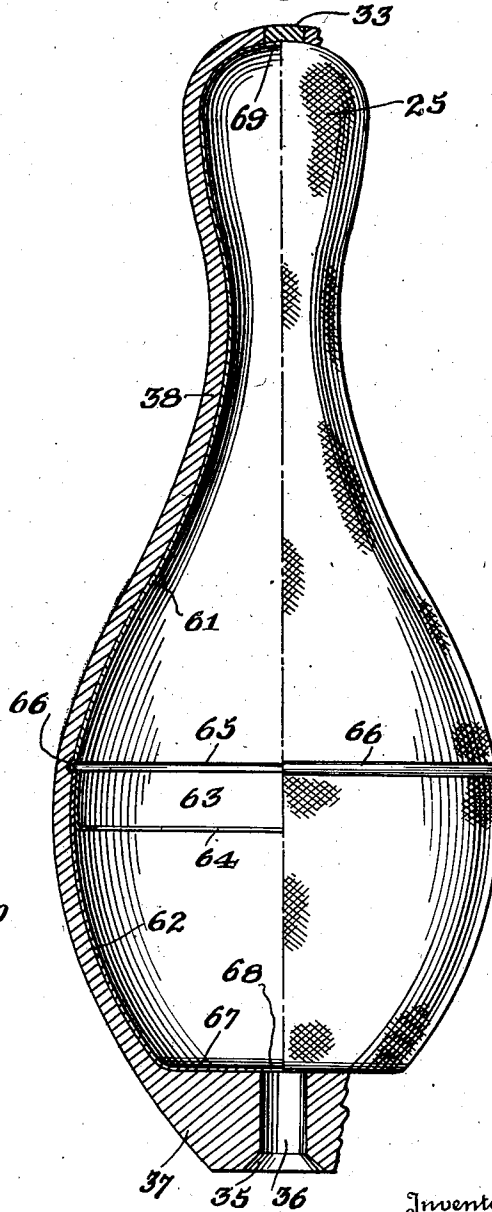


Fig. 7.



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Fig. 8.

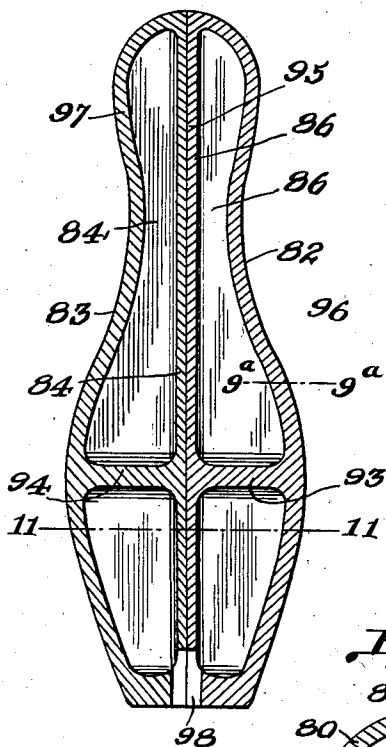


Fig. 9.

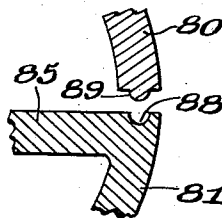


Fig. 10.

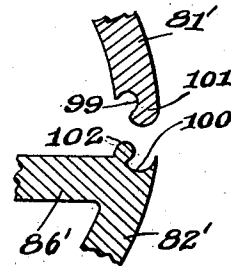


Fig. 9a.

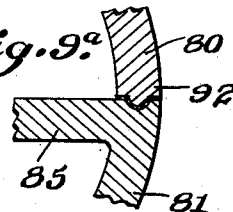


Fig. 11.

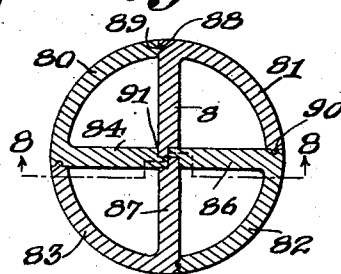
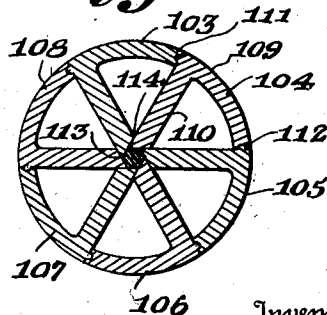


Fig. 12.



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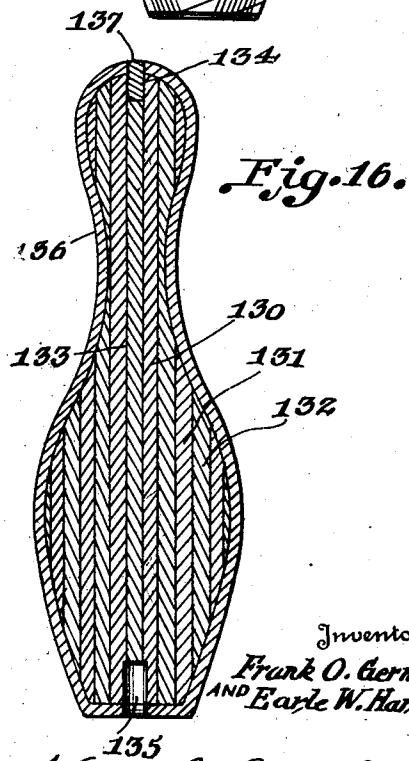
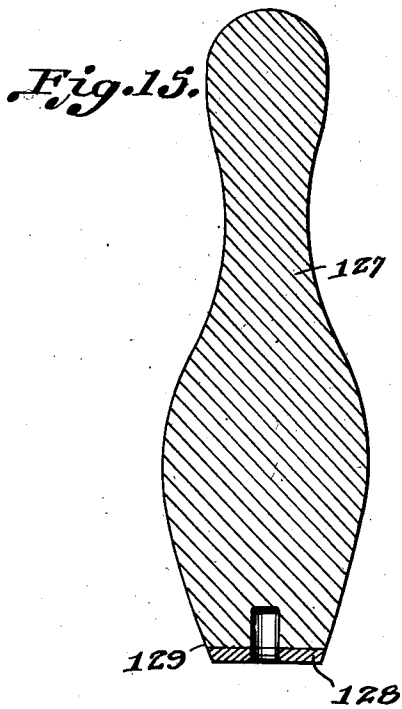
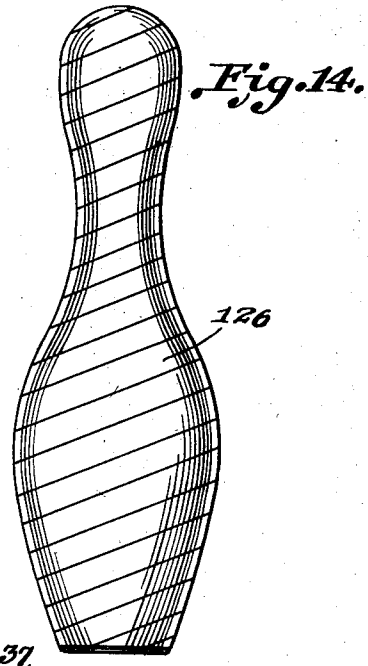
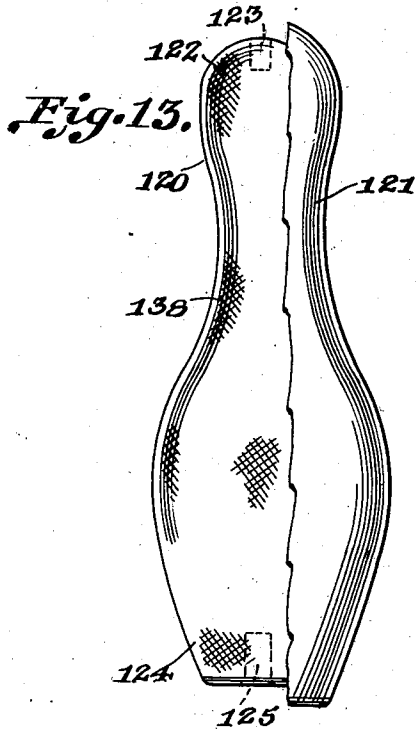
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,166,950

GAME APPLIANCE AND METHOD OF MAKING

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Application September 15, 1937, Serial No. 164,044

3 Claims. (Cl. 273—82)

This invention relates to an improved bowling pin construction and to an improved method of making and the composition of such pins or the like.

One object of this invention is to provide an improved bowling pin construction. Another object is to provide a bowling pin which has the advantages of the solid wooden pins but which is free of the disadvantages of such pins. Another object is to provide a pin having the desired click and balance of the wooden pins and which is cheaper to construct. A further object is to provide a pin having a metallic core and a non-metallic outer layer.

Yet a further object of this invention is to provide an improved bowling pin construction fabricated entirely of plastic material such as synthetic resins and thermo-plastic resins. Another object is to provide a bowling pin construction entirely fabricated of cellulose acetate material. A further object is to provide a bowling pin fabricated from two or more similarly shaped sections of cellulose acetate. Yet another object is to fabricate a pin having elemental segments of cellulose acetate united into a unitary structure by being cemented along abutting surfaces by cellulose acetate. Yet a further object is to arrange the abutting surfaces in such a manner that an extended area of contact is provided.

Still further objects of this invention are: to provide an improved game appliance having a central core of wood; to provide a bowling pin with means for centering it in position for playing; to provide a bowling pin having a wooden core and a covering of cellulose acetate; to provide a bowling pin construction having a central core and an outer surface of spirally wound strip material; to provide a bowling pin with a central core and an outer surface formed by a spirally wound strip of cellulose acetate material; to provide a bowling pin having a non-metallic base portion arranged to withstand wear; to provide a bowling pin formed with a laminated core and an injection molded non-metallic outer surface; and the formation of a bowling pin or game appliance from a core of compressed material with a molded outer surface.

Other objects and advantages of the invention will be ascertained from the following description when taken in connection with the accompanying drawings.

In the drawings, Fig. 1 is a vertical elevation partly broken away showing a composite pin incorporating features of this invention. Fig. 2 is a vertical elevation partly in section showing the

core taken at right angles to the view of the core in Fig. 1. Fig. 3 is a vertical elevation partly in section of a metallic core incorporating certain features of this invention. Fig. 4 is a transverse cross section of a core taken substantially on the line 4—4 in Fig. 2. Fig. 5 is a transverse cross section showing a modified detail construction taken on a line corresponding to the line 5—5 in Fig. 3. Fig. 6 is a vertical elevation partly in section of a further variation in core construction. Fig. 7 is a vertical elevation partly in section illustrating further features of this invention.

Yet further, Fig. 8 is a vertical cross section of a pin incorporating features of this invention and entirely fabricated of cellulose acetate material. Fig. 9 is a detail view showing one method of increasing the abutting surface areas. Fig. 9A corresponds to a section on the line 9A—9A in Fig. 8 showing the joint in the assembled structure. Fig. 10 shows another type of joint. Fig. 11 is a transverse cross section through a pin having another variation in details and corresponding to a section taken on the line 11—11 in Fig. 8. Fig. 12 is a transverse cross section through a further variation in the pin construction corresponding to a section of the said pin taken along a line 11—11 as in Fig. 8.

Still further, Fig. 13 is a vertical elevation partly broken away showing a solid core member and a molded outer body portion thereon. Fig. 14 is a vertical elevation of a bowling pin formed with a central core and the outer body portion fabricated from a spirally wound strip of cellulose acetate. Fig. 15 shows the solid core with a wear plate on the bottom. Fig. 16 shows a bowling pin construction using a solid core formed of laminated material with an outer non-metallic covering portion.

Considering the drawings in greater detail, Fig. 1 illustrates a composite bowling pin comprising a core 20 compressed within an outer molded covering 21. The metallic core 20 is composed of complementary hollow metal members 22 and 23 fastened together along a medial plane 24 by butt welding or in some other appropriate manner. The surface of this hollow steel core is knurled or roughened, as shown in spots at 25, 26, 27, 28, 29, and 30. The knurling is for the purpose of assisting the molded covering 21 in adhering to the outer surface of the inner core.

The metal core 20 is shown in Fig. 2 partly in section along the plane of jointer 24 in Fig. 1. In this figure core 20 is provided with upper and lower axial openings 31 and 32 respectively. These openings cooperate with pins serving to hold the metal core centrally in a mold so that a

uniform body of molded material will be formed about the core. The molded material may be formed about the core by either compression or injection methods of molding. According to the first named method, a resin or other plastic material in comminuted or other form is placed in the mold, and the application of heat and/or pressure is utilized to form the material about the metal core. After the operation is completed, the opening 31 in the top of the pin is plugged up as at 33 in Fig. 7. The opening in the bottom of the pin is allowed to remain, to serve in setting up bowling pins on the locating pins used in some bowling alleys. After the bowling pins have been centered, the locating pins are allowed to drop leaving the bowling pins remaining in position for the game. The bottom opening 36 may be especially formed and may be counter-sunk as at 35 in Fig. 7. The thickness of the molded material at the bottom 37 of the pin is considerably increased so as to provide for the wear which takes place at this portion of the bowling pin when the pins are in use. Remaining portions of the pin are covered by a relatively uniform depth of material as indicated at 38.

Although balls used in bowling have not been shown, it is equally contemplated to apply the features of this invention to the balls as well as to the pins. In fact, features of this invention are equally applicable to the various types of bowling pins such as duck pins, ten pins, candle pins, and rubber necks.

By this invention the plastic material utilized to form the molded body 21 of the composite pins contemplates, for example, among others the use of such materials as disclosed in the Patent 2,048,686 to Fred R. Conklin, for either the compression or injection molding processes. Other plastic materials composed of cellulose acetates are also contemplated.

By the injection molding process the hot fluid mass of the resin or plastic material is forced into the mold about the core and the mass is chilled as well as compressed to form the molded layer of material.

In Fig. 3 the core is shown formed with two or more grooves 39 and 40 which may be spun or stamped into the core to provide greater gripping of the covering material into the core at the point of impact of the ball and also for the purpose of structurally arranging the parts for a better distribution of impact loads. It may be desired to continue these grooves in the form of a series of corrugations extending from about the point 41 to about the point 42. It will of course be understood that the outer surface of the pin with its covering will be smooth as in Fig. 7 when the pin is completed. The covering will fill up the grooves 39 and 40.

Fig. 4 shows one method of securing the complementary portions of the core together. In this instance, the parts have been butt welded with the weld material at the joints being indicated at the points 43 and 44. Other methods of securing these parts together may be utilized. For example, flash welding may be also under appropriate conditions. In Fig. 5 parts of the core 22' and 23' are fastened together by means of overlapping portions 45 and 46, and 47 and 48. At these points the overlapping parts may be united for brazing, soldering or welding at 49 and 50.

In Fig. 6 the core is constructed of upper and lower sections 51 and 52 telescoping together and having considerable overlap in the region 53 to form a band having a double thickness of metal

extending around the pin. For further support the bottom edge 54 of the upper part of the pin is flanged inwardly as at 55. A thin steel plate 56 may be secured to this flange to further structurally strengthen the end, and thin steel cups 57 and 58 may be secured at the points of greatest strain at the neck 59 and belly 60 of the pin.

The foregoing structural features may be varied somewhat to accomplish slightly different structural combinations. In Fig. 7 the upper part 61 telescopes within the lower part 62 and the indented annular portion 63 of the upper part terminates in the inwardly extending flange 64. The upper part telescopes within the lower part and abuts against the upper edge thereof by means of the outwardly indented bead 65. This bead which is more readily observed on the outer side of the pin as at 66 serves as a means of further securement between the molded covering and the metal core. The bottom of the metal core 67 is provided with a central opening 68 and the head of the pin has a central opening 69 each of which are free of the indented flanges illustrated at 70 in Figs. 2, 3 and 6.

Considering further figures of the drawings in greater detail, the pin entirely of cellulose acetate as illustrated in Fig. 8 may partake of various structural variations. In Fig. 8 a pin is illustrated as being fabricated from four similarly shaped sectors and having a transverse rib and a vertical rib. The transverse section of such a pin is shown in Fig. 11 and comprises the similarly shaped sector parts 80, 81, 82 and 83. Each of said parts has a vertically and radially inwardly extending rib section as 84, 85, 86 and 87 respectively, the outer wall of the vertical rib in each instance having a groove 88. Each of the peripheral parts has a complementary tongue or flange portion 89 arranged to seat in the groove. Each of these parts is fabricated substantially entirely of cellulose acetate plastic material and the abutting surfaces as, at 90 and 91 are treated with a cementing mixture comprising a liquid solution of cellulose acetate and a volatile constituent, so that when the parts are pressed together the volatile constituent, being exposed to the air, readily evaporates and the resulting structure forms a continuous wall of cellulose acetate having a thickness of sealing material as at 92 in Fig. 9A. Horizontally extending ribs are similarly provided, such portions being visible at 93 and 94 in Fig. 8. The sealed joint similar to that at 92 will also occur at the central part of the end along the surfaces of joiner at 95.

It is equally feasible to prepare the pin, as just described by merely using two complementary members instead of using four parts so that the right hand half of the pin 96 and the left hand half 97 go together and form a single vertical rib and a single horizontal rib. In such a construction the central rib would not be shown in two parts as in Fig. 8 but would be shown as a single thickness of material.

When the various parts are secured together in the molding operation the body of the material and the joints become a continuous and homogeneous wall of cellulose acetate, the walls being in the neighborhood of about one-half inch thick with the transverse rib located at the appropriate point to give the maximum reinforcement to the pin. The thickness of the walls and rib is so regulated as to keep the center of gravity of the pin at the same relative point as in a wooden pin. The hole 98 is similarly provided in the

bottom of the pin as hereinbefore described. The transverse section of the pin as just described is not illustrated in the drawings but its construction will be readily understood. The vertical section shown in Fig. 8 corresponds to the pin as shown in Fig. 11.

In Fig. 10 the abutting surfaces are provided with the irregularly contoured tongue and groove portions 99 and 102, and 100 and 101. In this arrangement the corresponding portions of the segments themselves are indicated at 81', 82' and 86' corresponding to the previous description of Fig. 11.

In Fig. 12 transverse cross section of a pin of slightly different arrangement is shown, vertical cross section not having been illustrated. In this instance, the pin is composed of six equal parts 103, 104, 105, 106, 107, and 108 arranged with peripheral portions 109 and radially extending portion 110. Each radial surface of the peripheral portion as at 111 and 112 is provided with the enlarged contact surface and the inner radial limits of the walls at 110 are arranged to provide a hexagonal opening 113 running centrally throughout the pin. In this instance, the parts are cemented together as previously described and the central space 113 can be filled or left open depending upon the design. It is preferable however to fill this opening with a hexagonal rod of suitable material preferably corresponding to the material of which the remaining portions of the pin are made. A metal rod may be used under proper circumstances. The vertical cross section of this pin is not shown.

Each pin, as described in connection with Figures 8 to 12, inclusive, is preferably prepared by compression molding. However, this is to be taken as the preferred manner of construction and is not to be construed as a limiting restriction.

In the further figures of the drawings, Fig. 13 shows a bowling pin made with a core 120 and a molded surface layer 121. The core may be of solid or hollow construction and may preferably be a solid core of wood. In such a case, a cheap light wood is satisfactory, it being understood that selected wood free of knots is not contemplated as being necessary. The head 122 of the core contains a hole 123 and the bottom 124 of the core contains a hole 125. These upper and lower holes 123 and 125 respectively are used for centering the core in the mold. In completing the ten pin the core is centered in the mold by the pins of the mold extending into these openings and the ten pin is completed by the injection molding process. After the pin has been withdrawn from the mold the top hole will be closed by a plug of the same material of which the outer surface is made and will preferably be made of a composition of cellulose acetate. The bottom hole will be left open for use in setting up the pins in a bowling alley.

In Fig. 14 the bowling pin has been made by utilizing a core of suitable material and by spirally winding a strip of cellulose acetate about the core. In this figure, which is an elevation, the spiral strip is indicated at 126 as being wound about the core and providing a smooth outer contour. In this instance, the core may preferably have a smooth outer surface which may be obtained in various materials such as kiln dried wood, a die casting of cheap light metal, or a composite core of two halves stamped from steel which is joined by welding at the edges and having the edges of the joint ground smooth.

The strip of cellulose acetate may have an appropriate thickness of about one-sixteenth of an inch, and an appropriate width of about three-fourths of an inch. The strip is moistened in a volatile liquid solution of cellulose acetate which renders the strip soft and pliable. While in this condition it is wrapped spirally around the core with the edges of each succeeding turn tightly abutting the adjacent edges of the next convolution. The abutting joints flow together as the volatile matter evaporates and the covering shrinks on and becomes one continuous coat. The whole outer surface may thereafter be machined to a smooth finish, to erase any possible roughness that might occur at the spiral joints, or at the closure at the top of the pin.

Fig. 15 is a cross section of a core 127 for the spiral wound type of covering and shows a bottom plate 128 of molded cellulose acetate of suitable thickness to withstand the wear at this point caused by the locating pins used in bowling alleys. It will be understood that the spiral strip is wound so as to completely cover the joint 129 between the body plate and the body of the core thereby providing a continuous smooth coating of the entire outer surface of the pin.

It is often desirable to form the core of the pin from a laminated structure, and in such a case, the construction illustrated in Fig. 16 will result. In this instance, the core 130 may be made of several layers 131, 132, etc., of ply wood laid cross grained and glued along the adjacent surfaces 133 and pressed together into an appropriate block. The block is then machined to proper size and shape. It is preferable to mold the outer surface upon this pin by injection molding and the openings 134 and 135 are provided for the centering pins in the mold. After the outer layer 136 has been applied by the injection molding process, the upper opening 134 is closed by means of a cellulose block or plug 137 cemented therein. The bottom hole is left open as previously explained.

In this connection, it is equally contemplated as within the scope of this invention to form the laminated construction from sheets of cellulose acetate material, cemented together by a solution as described, or combinations of the cellulose and ply wood. The laminations preferably extend in the vertical direction throughout the core. In some instances the outer covering may be provided by the spirally molded strip as heretofore described instead of by the injection molding process.

In connection with Fig. 13 the outer surface of the core 120 may be preferably roughened as at 138 so that the molded covering will adhere tenaciously to the core, both by the adhesive action of the material itself and the additional gripping provided by the roughened surface.

It is also contemplated that the core of Fig. 13 may be formed from compressed sawdust or wood fiber using an appropriate binding, for example, glue. Other plastic materials and binders may include polystyrene resin, acrylic resin, glyceryl-phthalic anhydride, other resins, and synthetic resins. Rubber compositions may occasionally be used as well as phenal formaldehydes.

Where rubber compositions are used the rubber may have properties extending over a very wide range from relatively soft to relatively brittle rubber. The rubber may also comprise a composite mass which in effect combines portions of rubber having one set of characters and other portions with a different set.

These materials may be satisfactorily bonded to the metal core for example, by first sand blasting or pickling the core to clean the outer surface thereof and then brass plating it. After the core has been brass plated, a thin medium soft coat of rubber may be first applied and then over it a coat of harder stock rubber giving the necessary dimensions. The assembly is placed in a mold and both hydrostatic pressure and heat are applied. After an appropriate interval of time the rubber will be vulcanized and the finished article may then be removed from the mold. In view of the relatively thin dimensions of the metallic cores, it will be preferable in this molding process, which may use a hydrostatic pressure of the order of about a thousand pounds per square inch applied externally to the rubber, to apply a pressure internally of the core to prevent it from collapsing. This may be accomplished by applying pressure to the inner surface of the core by either water or sand.

It will be readily appreciated that the pins may be made wholly or in part from the plastic materials as heretofore explained, and the materials may be flowed as in the injection process, or compressed as in the compression process, or otherwise applied.

The parts of the metallic cores may be secured together by resistance welding. By butt welding and flash welding. Brazing and soldering can also be utilized to advantage depending on the metals used. Arc welding can also be adapted to the needs of this work by using either the electric arc or the gaseous arc.

Although the features of this invention and the

process of applying them to actual structures have been set forth in regard to preferred embodiments, variations within the true spirit and scope of the same will be determined by the appended claims.

What we claim is:

1. A bowling pin comprising a multi-part outer shell having the configuration of a bowling pin, radially disposed longitudinal ribs carried by each part, each of said longitudinal ribs having a reduced inner portion and a transverse rib intersecting said longitudinal ribs at a point intermediate the ends of said latter ribs, said longitudinal and transverse ribs having a composition similar to the composition of said outer shell, and the longitudinal rib of one part overlapping a longitudinal rib of another part.

2. A bowling pin comprising an outer shell formed of a plurality of arcuate sectors, a radial longitudinally disposed rib carried by one edge of each sector and a reduced portion carried by the inner edge of each rib, the reduced portions of said ribs overlapping each other axially of said shell.

3. A bowling pin comprising an outer shell formed of a plurality of arcuate sectors, a radial longitudinally disposed rib carried by one edge of each sector, said ribs having reduced inner portions contacting with each other axially of the shell, one edge of each sector having a longitudinally disposed groove, and a bead carried by the other edge of each sector engageable in a groove of an adjacent sector.

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