United States Patent

Berry

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[54] **BOWLING PIN WITH CHEEK ELEMENTS FORMED OF WOOD PARTICLES AND RESIN BINDER**

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[51] **Int. Cl.** **A63d 9/00**

[58] **Field of Search** ..... 273/82 R

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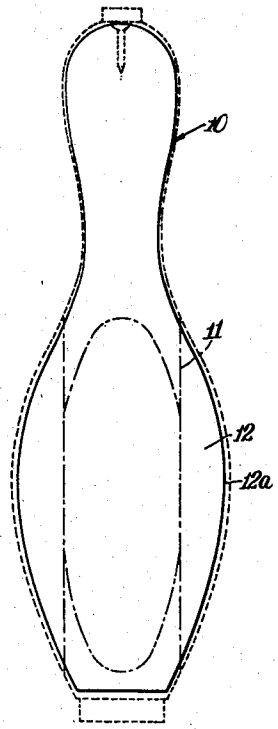
[57] **ABSTRACT**

A bowling pin structure wherein the cheek portions of the pin are molded to define controlled density wood fiber and binder resin materials secured about a core. The assembly is machined to define the desired bowling pin body configuration. The cheek material is compressed to provide a preselected density distribution to provide high durability and controlled scorability while maintaining the overall weight approximately that of conventional wood pin materials.

4 Claims, 8 Drawing Figures



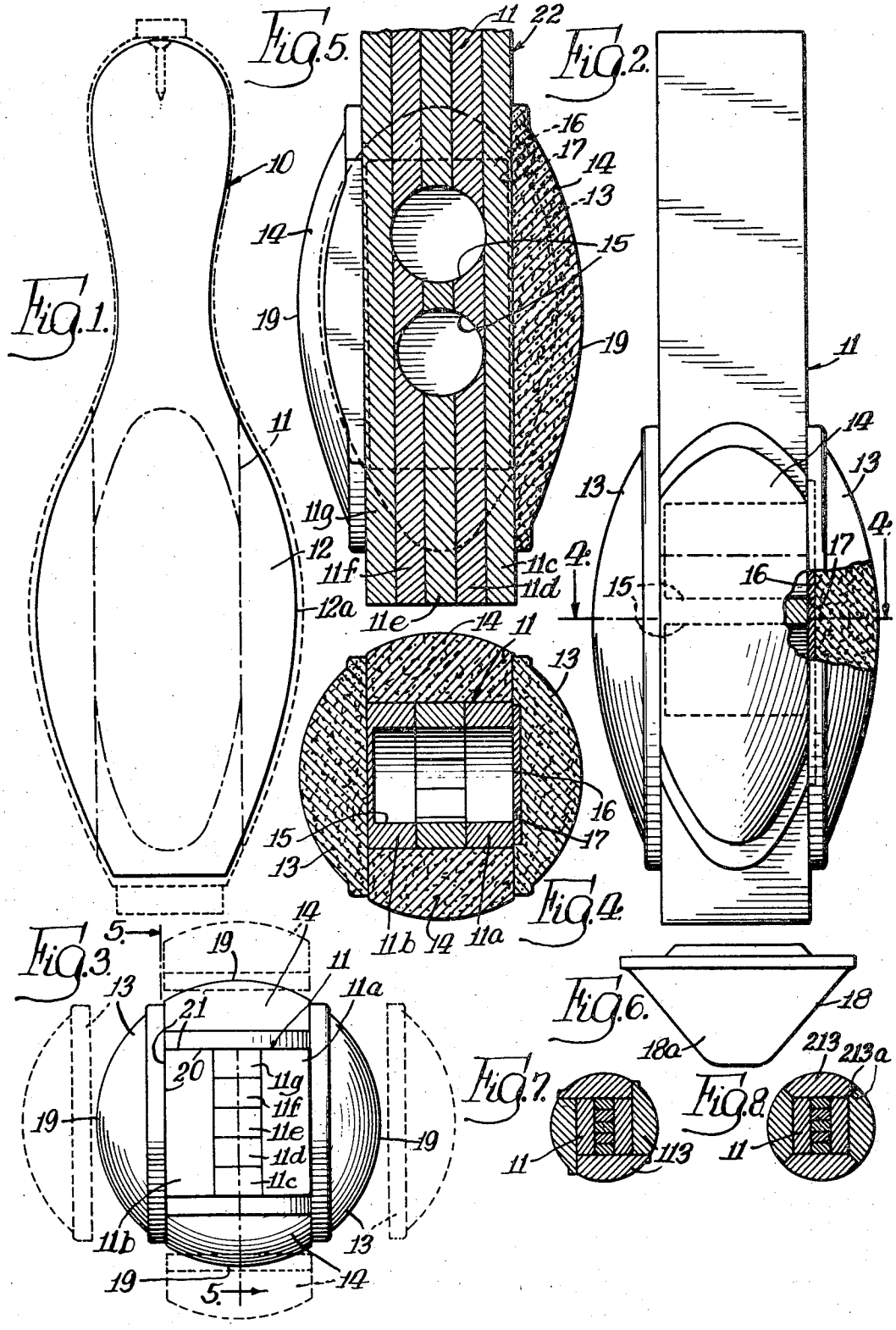


Fig. 1.
Fig. 5.
Fig. 2.
Fig. 4.
Fig. 3.
Fig. 6.
Fig. 7.
Fig. 8.
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12a
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BOWLING PIN WITH CHEEK ELEMENTS FORMED OF WOOD PARTICLES AND RESIN BINDER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to compression molded articles and in particular to compression molded wooden articles. More specifically, the invention relates to forming of bowling pins and the like by compression molding at least a portion thereof.

2. Description of the Prior Art

The conventional bowling pin is formed by suitable machining of a wood block, such as a maple block. It has been desirable to utilize a particulate wood material in the forming of such bowling pins. However, there has been no fully satisfactory method of utilizing such material because of the difficulty of obtaining the desired durability and scorability while maintaining the desired density of the built-up pin and the overall weight thereof approximately that of a conventional machined wood pin.

One method of forming a conventional solid wood pin is to provide a plurality of cheeks bonded to an axial core member and machine the resultant assembly to the final pin configuration. Such a method of construction minimizes the amount of waste in permitting a general conformity to the pin configuration by the blank defined by the core and assembled cheek elements.

SUMMARY OF THE INVENTION

The present invention comprehends forming a bowling pin wherein cheek elements are formed from particulate wood material within a resin binder. The cheek elements are secured to a core formed of solid wood material by suitable adhesive means and the final bowling pin is obtained by suitable machining of the thusly formed blank.

The invention comprehends improved cheek elements. The resultant cheek element may have a preselected density distribution and an overall weight approximately that of conventional solid wood bowling pin material.

The particulate wood material may comprise splinters held by a suitable resin binder preselected to provide desired durability and scorability within the requirements of the bowling industry. The wood particles may be gravity-deposited in a suitable mold cavity to define a preform which is subsequently compression molded with a resin binder to form the controlled density cheek element. The binder may be introduced as by spraying onto the wood particles and tumbling the wood particles with the binder. The binder may be present in a ratio of approximately 8 to 16 percent by weight. The splinters may be elongated having a length of at least approximately 4 times the width thereof to provide an improved cheek construction. The cheek elements may have a resultant density similar to that of the solid wood core and having a distribution whereby the maximum density and durability is provided at the ball line, or belly. The bowling pin further may be arranged to have a preselected center of gravity and moment of inertia conforming to established bowling equipment standards.

By virtue of the ability to control accurately the density of the molded cheek portions, the resultant pins may have a high uniformity in overall weight. Because of inherent variability in the density of normal maple wood, it has been extremely difficult to provide accurately uniform weight in sets of such maple pins. The present invention provides the highly desirable weight uniformity in a simple and economical manner.

BRIEF DESCRIPTION OF THE DRAWING

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing wherein:

FIG. **1** is an elevation of a bowling pin embodying the invention shown in full lines, with the rough finish configuration thereof illustrated in broken lines;

FIG. **2** is an elevation illustrating an assembled blank construction from which the bowling pin may be machined;

FIG. **3** is a top plan view thereof illustrating the method of assembling the cheek-forming elements in broken lines;

FIG. **4** is a transverse section taken substantially along the line **4—4** of FIG. **2**;

FIG. **5** is a fragmentary diametric section taken substantially along the line **5—5** of FIG. **3**;

FIG. **6** is a side elevation of a preform for use in forming the cheek-forming elements;

FIG. **7** is a transverse section similar to that of FIG. **4** but showing a modified form of bowling pin embodying the invention; and

FIG. **8** is a transverse section similar to that of FIG. **4** but showing a further modified form of bowling pin embodying the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the exemplary embodiments of the invention as disclosed in the drawings, a bowling pin generally designated **10** is shown to comprise a built-up bowling pin defined by an axial core **11** and a cheek portion generally designated **12** suitably bonded to the core. The present invention comprehends an improved cheek construction providing improved durability and scorability.

Core **11** may comprise a conventional core formed as a laminated center post of a plurality of laminae **11***a*, **11***b*, **11***c*, **11***d*, **113**, **11***f* and **11***g*. The illustrated laminated core is exemplary only, it being obvious to those skilled in the art that other arrangements of the laminae of the core may be used as is conventional in the bowling pin forming art. The laminae are suitably joined as by gluing and are preferably formed of conventional bowling pin material, such as maple strips. As illustrated in FIG. **3**, the core may be square in cross-section.

It has heretofore been known to form bowling pins by securing portions of wood from discarded bowling pins to such a core permitting machining of this assembly to define a rejuvenated bowling pin construction. The present invention comprehends providing an improved cheek-forming element on such cores to define a new bowling pin construction having substantially improved bowling pin characteristics.

More specifically, cheek forming elements **13** and **14** may be adhesively secured to the core in a quadrangular arrangement as best seen in FIG. **4**. One or more holes **15** may be provided in the core overlying the cheek-forming elements to control the weight of the pin. Where such holes are provided, the strips **16** spacing the holes **15** may be provided in suitable recesses **17** in the cheek-forming elements, such as elements **13**. Strips **16** may be formed of a suitable material such as maple or other material of like strength preventing extrusion of the cheek material into holes **15** as a result of the forces generated in the use of the pins.

As will be obvious to those skilled in the art, other arrangements of the cheeks about the core may be utilized. Thus, as shown in FIG. **7**, a plurality of similar cheek elements **113** generally similar to cheek elements **13**, but having one arcuate segment removed to permit overlapping by the next adjacent cheek element, may be utilized. Thus, in this construction, each of the cheek elements is similar. The construction of FIG. **7** provides the further advantage of requiring only a single handling of the core and cheek elements in the gluing operations.

Alternatively, as shown in FIG. **8**, a plurality of cheek elements **213** may be provided about the core **11**, cheek element **213** having angled edges **213***a* at 45° permitting the cheek elements to be brought together simultaneously for facilitated assembly.

Cheek-forming elements **13** and **14** are preferably formed of wood particles in a suitable binder resin. The cheek-forming elements are formed to have a preselected density simulating that of the bowling pin maple wood and varying from a maximum at the ball line **12***a*, or belly, of the pin. By suitable selection of the materials of which the cheek-forming elements are formed, accurate control of the durability and scorability is readily effected.

The cheek-forming elements may be formed by deposition of resin coated wood particles, such as maple splinters. The wood particles are preferably elongated, having a length of at least approximately 4 times, and up to approximately 8 times the width thereof. The resin binder may be introduced by spraying onto the wood particles and tumbling the sprayed wood particles. As will be obvious to those skilled in the art, other suitable methods of applying the binder may be utilized within the scope of the invention.

The wood particles may alternatively be in the form of flakes, shavings, slivers, ground or shredded wood, chips, etc. In one preferred form, the wood particles comprise coarse splinters which are hammermilled through a ⅜ inch screen to a screen separator and thence through a No. 10 screen to have approximately 50 percent thereof retained on a No. 18 screen and 50 percent thereof retained on a No. 35 screen. One example of such a wood particle composition is that having the following composition:

SCREEN	% RETAINED
10	0.1
12	1.5
14	4.4
16	10.7
18	10.0
20	20.0
25	11.7
30	14.0
35	13.7
40	8.3
45	4.1
60	1.3
Pan	0.2

It has been found that the use of relatively fine material tends to weaken the cheek and, thus, it is preferred that the bulk of the wood particles be larger than those retained on a 35 mesh screen.

The resin binder may comprise a suitable plastic such as urea formaldehyde. Other suitable resin binders include phenol formaldehyde, melamine formaldehyde, etc.

The amount of binder is preferably maintained relatively low such as under approximately 16 percent and over approximately 8 percent. A 12 percent ratio has been found to provide excellent results. The spraying of the resin onto the wood such as while continuously tumbling or moving the wood particles causes an exposure of substantially all surfaces of the particles to the resin to provide an improved bonding with a small amount of resin.

The cheek-forming elements are firstly formed as preforms which may be suitably compressed to have a preselected density. Illustratively, as shown in FIG. **6**, a preform **18** such as for use in forming the cheek-forming element **13** is illustrated to comprise a shaped preform which has a thickness preselected so that upon compression thereof to define the cheek element, the density of the cheek element will be greatest at the ball line **12***a* and decrease toward the top and bottom. Illustratively, the density at the top and bottom of the cheeks may be approximately 5 to 10 percent lower than at the ball line. The use of the preform **18** reduces the time of the molding operation desirably.

Illustratively, in forming the preform, a pile of resin coated wood splinters is compressed to about one-third its original loose size. In the molding operation, the preform is compressed to about one-half the preform configuration. Illustratively, starting with a pile of resin coated wood splinters approximately 6 inches high, the preform is reduced to about a 2–¼inch height and the cheek element is compressed to approximately a 1–3/16 inch height at the center.

The forming of preform **18** is effectively a felting operation wherein the wood particles are caused to orient themselves substantially parallel to the flat plane. As is conventional in such felting operations, a vacuum may be utilized to assist the drawing down of the felted mat. The compression of preform **18** is effected in the same direction as the compression of the original pile to form the preform.

The preform is cured in a suitable compression mold (not shown) with suitable application of heat to form the cheek element. Illustratively, where the binder comprises urea formaldehyde, the preform may be cured at 300° F. for approximately 10 minutes. Suitable catalyzing means may be blended with the resin to assure the full curing at this temperature and time.

As best seen in FIG. **3**, cheek elements **14** are narrower than cheek elements **13** whereby cheek elements **13** overlap the edges of cheek elements **14**. The outer surfaces **19** of cheek elements **13** and **14** effectively define in section a circle, as best seen in FIG. **3**. The inner surfaces **20** of the cheek elements are flat so as to have facial bonded engagement with the outer flat surface **21** of the core **11**. Upon completion of blank **22** shown in FIG. **2** wherein cheek-forming elements **13** and **14** are adhesively secured to the core **11**, the blank

may be suitably rough machined to the dotted line configuration of FIG. 1 and subsequently finished to the full line configuration of FIG. 1 defining the desired bowling pin. The resultant pin has a preselected density and weight meeting all of the ABC specifications and requirements for bowling pins.

The controlled density of the cheeks made possible by use of the above disclosed method provides an improved cheek construction over conventional solid wood cheeks which may vary substantially in density beyond the controlled range obtainable by the forming method of the present invention. Further, because of the difficulty of controlling grain orientation in solid wood cheeks, improved impact characteristics are obtained with the formed cheeks of the present invention. By controlling the binder and wood particle characteristics as discussed above improved durability is obtained. This increased durability is obtained without increasing the overall weight of the pin material as heretofore has been required. Illustratively, the average density may be obtained at approximately 46 to 50 pounds per cubic foot corresponding to the usual density of the hard maple commonly used in such bowling pins.

While the invention has been disclosed primarily in connection with the forming of bowling pins, as will be obvious to those skilled in the art, other wood-like objects may be formed by the novel method of preforming a pile of resin coated wood particles to define a preform having a preselected thickness permitting subsequent compression molding of the preform to result in a molded object having a preselected controlled density distribution notwithstanding a wide variation in the thickness of different portions thereof. This method is particularly advantageous in the forming of bowling pin cheeks as discussed above.

The foregoing disclosure of specific embodiments is illustrative of the broad inventive concepts comprehended by the invention.

I claim:

1. A bowling pin having a head, a neck, a base and a belly comprising;

a solid wood core element forming the head and neck of the pin and extending longitudinally thereto to the base of the pin, a plurality of cheek elements secured to said core, and together with said core comprising a substantially solid belly portion of the pin, said cheek elements comprising a compaction of wood particles secured together with a resin binder, said cheek elements of said pin having a preselected density distribution such that the density of said cheek elements is greatest in the area of the ball line surrounding the belly of the pin and decreases toward the top and bottom.

2. A bowling pin having a head, a neck, a base and a belly comprising a solid wood core element forming the head and neck of the pin and extending longitudinally thereto to the base of the pin, a plurality of cheek elements secured to said core, and together with said core comprising a substantially solid belly portion of the pin, the cheek elements comprising a compaction of wood particles secured together with a resin binder, said long axes of the wood particles being oriented substantially parallel to a plane parallel to the long axis of the pin and being compacted substantially along an axis perpendicular to said plane and the pin axis so that the flat sides of said particles will be presented to ball impact.

3. A bowling pin having a head, a neck, a base and a belly comprising;

a solid wood core element forming the head and neck of the pin and extending longitudinally therethrough to the base of the pin, a plurality of cheek elements secured to said core and together with said core comprising a substantially solid belly portion of the pin, said cheek elements comprising a compaction of wood particles secured together with a resin binder, and wherein said core has weight control holes drilled therein and further comprises means for covering said holes, and wherein a cheek element covering said core comprising said covering means has a recess therein adapted to receive said covering means.

4. The bowling pin of claim 3 wherein that portion of said core underlying said cheek elements is substantially rectangular with a cheek element secured to each side.

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