

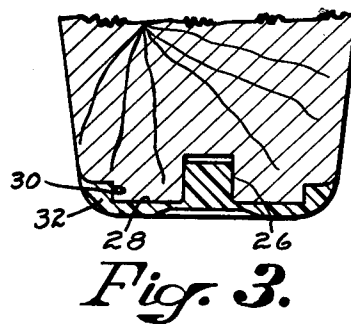
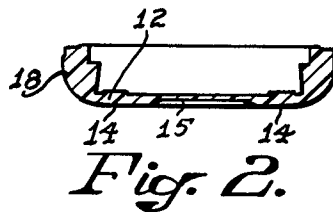
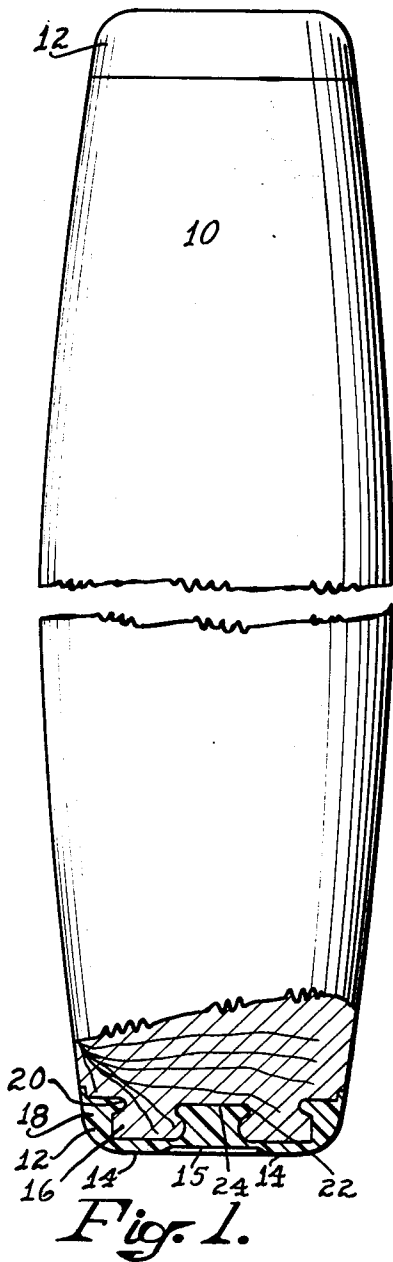
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BOWLING PIN

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BOWLING PIN

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1 Claim. (Cl. 273—82)

This invention relates to bowling pins customarily used in the game of ten pins and the like.

A bowling pin is usually made of wood, and the impact of the bowling ball tends to damage the pin as well as other pins struck indirectly, with the result that slivers or fractured segments are broken from the side of the pin, and if this fractured portion extends to the base on which the pin stands, then the pin must be discarded or sometimes repaired by squaring off the lower end and thus shortening the pin. A candle pin which is shaped as shown in Fig. 1 of the drawings has a regulation length of 15¾" and a diameter at the base of 2½". When made of hard maple wood, such a pin may have an average life of 450 strings or two to three weeks. In some bowling alleys, these pins are set up by an automatic pin setting machine, which has steel fingers and guides and other structural characteristics that tend to chew up the end of the pin as it is rotated and forced into a correct position, and this serves to round over or injure the base edge and may shorten the life to a total of 150 to 200 strings. If the pin is shortened to square up the base end, then it no longer conforms with the regulation size, and it will have to be discarded ultimately when it has become too short for further satisfactory use.

It has been proposed to provide a bowling pin with an elastic rubber cap sprung into place on the lower end of the pin or cemented thereto; but the high elasticity of this cap changes the nature of the game materially, and particularly in that a second pin struck by this blow softening cap is not driven with the desired forceful impact against other pins. Moreover, such a cap may become dislodged and thus permit injury to the pin. A metal plate has also been tried for the bottom of the pin, but this will injure other pins as well as the bowling alley. It has further been suggested that a wooden fibre cap be secured on the bottom of the pin by means of an interlocking wedge construction, but that wooden fibre cap tends to crumble at its edge or to break away from its fastening. It is hard and brittle and tends to mark up the alley and it does not possess the resiliency and durability which would permit it to serve solely as a base without interfering with the action of the pin. For such reasons, these various proposals have been discarded by the bowling pin manufacturers and the pins are customarily made of the solid wooden bodies.

It is the primary object of my invention to overcome these disadvantages and provide a bowling pin with a substantially integral base portion on which the pin may sit steadily and which will remain unaffected by usage and so materially lengthen the life of the pin and which will not interfere with the normal use of the pin or otherwise detrimentally affect the bowling game. Further objects will be apparent in the following disclosure.

Referring to the drawings which illustrate one embodiment of this invention as applied to a candle pin:

Fig. 1 is a vertical elevation of a wooden pin, partly broken away to illustrate the protective cap;

Fig. 2 is a vertical sectional view of a protective cap prior to its application to a new wooden pin body; and

Fig. 3 shows how such a cap may be used to restore the supporting base portion of a wooden pin that has been injured in use.

In accordance with this invention, I propose to make a bowling pin, whether a candle pin or duck pin or other suitable shape, of a hard wood body of suitable material which has its base portion fitted with a nylon cap shaped

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to provide a horizontal surface on which the pin will stand properly. This nylon cap is pre-molded to provide a flat supporting surface and it is applied to the bottom of the pin preferably by an operation which develops plasticity in the thermo-plastic material and causes it to adhere tightly to the wood base portion.

Referring to Fig. 1 of the drawing, I have there shown a candle pin 10 of substantially cylindrical shape which tapers symmetrically towards each end as illustrated. This pin has caps 12 of nylon applied on its upper and lower end or base portions. This nylon cap may be initially molded to a required shape, such as that shown in Fig. 2, so as to provide a flat continuous bottom surface 14 intended to be perpendicular to the longitudinal center line or axis of the pin so that the pin may stand squarely on this surface. The cap is preferably cut away centrally at 15 so as to limit the area of the bottom surface and insure that the pin is supported solely by an annulus 14 located near the periphery of the cap. The wooden pin may be variously shaped but for the manufacture of a new pin it is preferably turned down to form a portion 16 of reduced diameter about which the upstanding portion 18 of the cap may be secured. The wooden pin is further turned to provide at least one horizontal inwardly projecting annular groove 20 which is shaped and located to interlock with the cap and thus provide a shoulder which prevents removal of the cap. A further horizontal outwardly projecting annular groove 22 may be fashioned in a central vertical recess 24 so as to insure a second interlocking of the cap with the wood of the pin as illustrated in Fig. 1.

The cap may be variously shaped, such as the configuration indicated in the cross-sectional view of Fig. 2, which provides thermo-plastic material at points where it is needed for the interlocking operation. This cap is made of nylon having a moderate or low resiliency and low brittleness, and it is preferably made of a thermo-plastic nylon, which is a long chain polymeric amide having recurring amide groups formed by heating in an autoclave a mixture of adipic acid and a diamine salt. This material has high tensile strength, and an elasticity of 8% and a tenacity as high as 100,000 pounds per square inch when extruded as a filament. The polymeric amide is compounded with a suitable plasticizer and shaped as desired. The cap is preferably made of a nylon known as DuPont #6901 which is customarily used for making the tips of hammers and other types of tools requiring high resistance to impact and low resilience or bounce. In particular, the material is such that the bowling pin will not bounce materially when struck against another pin or the bowling alley and it will act substantially the same as would a hard maple pin. To aid in this requirement, the cap is made thin, as is indicated in the drawings which are substantially full size. For example, the cap may be about ⅛ inch thick at the bottom and ¼ inch at the side. This gives sufficient strength and elasticity for a normal use. The nylon has one characteristic which distinguishes it materially from wood, in that wood under impact tends to retain the dented shape and not to return to its original form. The nylon cap has the peculiar property of creeping back to its original shape even if subjected to stress beyond its true elasticity. Hence, it has resistance to the impact blow and will not retain a momentary indentation but will resume its original shape. Hence it will not shatter or be cracked or broken when subjected to severe usage. Consequently, the flat base will retain its original shape and the pin may be reset to a vertical position for as long a life of service as the wooden body of the pin permits.

The cap extends only a short distance up the pin body and does not present any large mass of resilient material which could cause trouble on the alley. As shown in Fig. 1, the cap is preferably ⅜" high and the flat surface 14 has a diameter of 2" while the diameter of the upper portion of the cap is about 2½". The cap conforms with the shape of the pin and forms a continuous surface similar to that of an all wood pin. It will be appreciated that this cap is applied to both ends of a candle pin but only to the lower end of a duck or bottle

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pin. Since the pin body remains unchanged other than being provided with a satisfactory base portion, the body is of standard shape and size and acts substantially the same as one made wholly of wood.

The cap is assembled on the wooden body by developing thermo-plasticity in the nylon and causing it to unite substantially integrally with the wood. This is preferably done by frictionally heating and softening the nylon by spinning the cap into place. To this end, the wooden body has its portion 16, 20 and 22 turned by a lathe or other cutting tool which leaves the wooden surface rough and highly porous, so that the thermo-plastic resin may interlock strongly with the wood. The candle pin is mounted in a suitable framework and held stationary while the cap is thrust into position where it surrounds the reduced end of the wooden body. The cap is then rotated or spun while being held under high enough pressure against the wood so that the thermo-plastic material is softened by the frictional heat and is caused to flow on its inner side enough to fill the roughened porous surfaces of the wood as well as such interlocking grooves as are provided for holding the cap in place. The outside of the cap retains its shape. Thereafter the cap is cooled while held in position on the pin so as to set it in its interlocking position. It may be suitably shaved or trimmed on its external surface, if needed, to provide a satisfactory appearance.

If a standard hard wood pin that has been damaged, but not too seriously, is to be provided with a nylon base, the cap may be applied in about the same manner, as indicated in Fig. 3. In this case, the lower end of the pin is sawed off or squared to provide a flat surface portion, and the inner cylindrical hole 26 customarily found in that type of pin is untouched. The pin may be turned in a lathe to provide an interlocking surface like the grooves 20 and 22 shown in Fig. 1, or it may be squared off, as shown in Fig. 3, to provide the flat bottom 28 and turned to form a portion 30 of reduced diameter. The wood surface is left rough. The nylon cap 32 is positioned over the reduced end 30 and then rendered thermo-plastic under frictional pressure, as above described. This causes the thermo-plastic material not only to fill the annular recess around the cylindrical reduced end 30 but also to fill either wholly or partially the cylindrical space 26 that has previously existed in the candle pin. The interlocking of the nylon with the rough surface of that inner space 26 aids in strengthening the cap portion and holding it firmly in place. However, this hole 26, heretofore used for centering the pin for a second turning and squaring operation, is no longer required since the nylon cap will give as long a life as the wooden body can stand and no further operation is needed for restoring the pin base.

This nylon cap made of the dimensions and material as above described gives the pin substantially the same normal action as has an all wood pin, and yet it lengthens the life of the pin so that it will average 1000 strings and often far more. Also, there is no further expense involved in restoring the shape of the base portion, since the pin can be used until the wooden body thereof has been so severely battered as to render it unsatisfactory.

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This pin is accepted by bowling pin associations for regulation use and particularly in view of the fact that the play is not changed by the use of this nylon base material. I have found no resin substitutes which will take the place of the nylon, since they are either too resilient or too brittle, or they disintegrate quickly under the heavy impacts, or they do not bond effectively to the hard maple wood and they may not be easily and satisfactorily applied thereto. The nylon, because of its thermo-plasticity at a low temperature, may be molded or rendered plastic interiorly without affecting the outer side and its shape. The frictional heat and pressure make a very strong and almost integral union between the nylon and the maple wood. Hence, this nylon provides the essential qualities of being non-brittle and sufficiently strong and resilient to be impact-resistant, and of a yielding elasticity which maintains the pin shape but will not cause the pin to bounce materially or more than does wood when striking another pin or the alley. Various other advantages will be found by the user and particularly the fact that the pin retains substantially the same bowling characteristics for a long life of service.

I claim:

A bowling pin comprising a body of required round shape having its entire impact surface composed of hard wood and a base portion of reduced diameter and at least one interlocking recess providing porous and fibrous wood surfaces, and a premolded cap of nylon secured permanently on said base portion, said cap being thin and located only below the area of normal impact by a bowling ball and having an outer round peripheral surface merging with the pin body exterior, said nylon cap having an irregularly surfaced inner portion penetrating and thermoplastically interlocked substantially integrally by frictional heat softening of only its inner portion with the pores and fibers of said wooden base portion and recess, and the outer portion of the cap having an initial premolded smooth surfaced shape unaffected by the thermoplastic uniting of the cap interior with the wood which provides a flat bottom surface perpendicular to the pin axis for supporting the pin vertically, said nylon cap being substantially non-brittle, durable, hard and impact-resistant and having a low resilience and a shape-retaining elasticity, which provides a bowling action not materially different from that of the wood body, and wherein the thermoplastic union serves to resist disruption and fracture of the wood adjacent to the cap.

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