Sept. 15, 1953 J. R. CURTIS 2,652,081

PROCESS OF MANUFACTURING BOWLING PIN BILLETS

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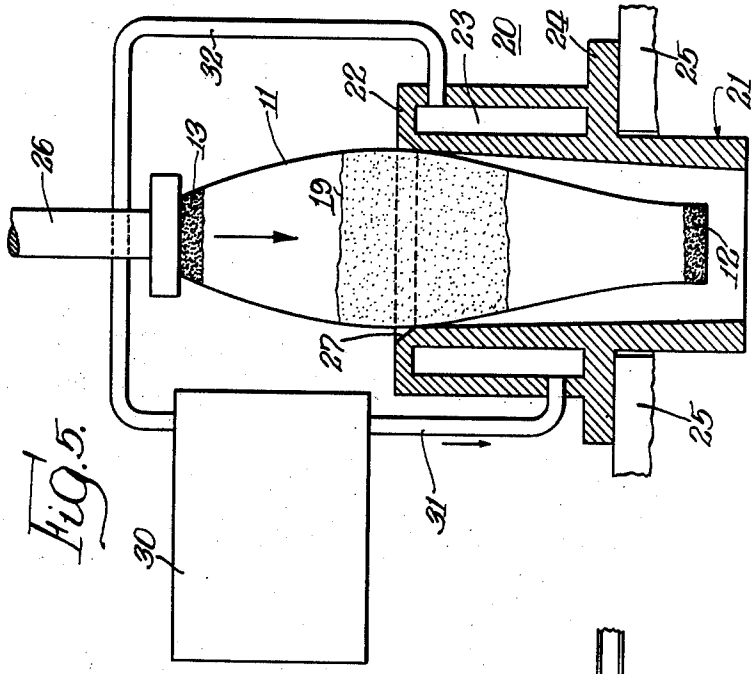


FIG. 5.

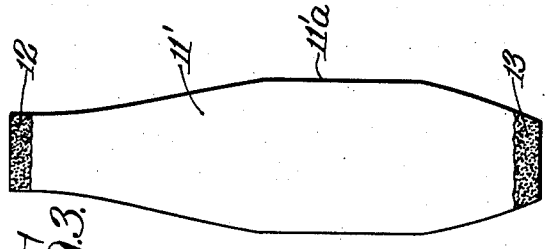


FIG. 3.

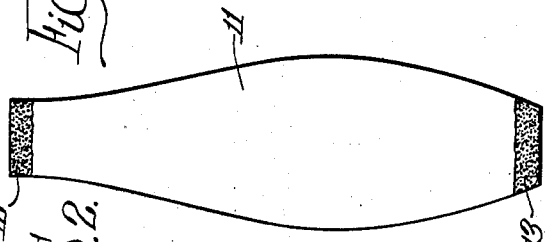


FIG. 2.

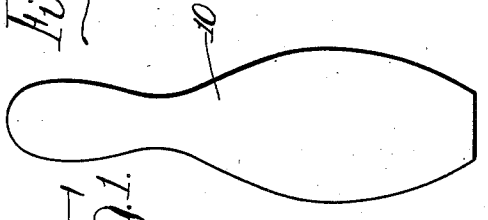


FIG. 1.

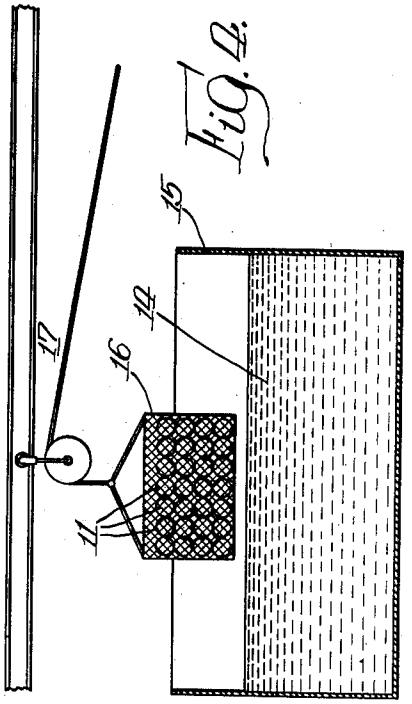


FIG. 4.

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PROCESS OF MANUFACTURING BOWLING PIN BILLETS

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1 Claim. (Cl. 144—309)

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The present invention relates to bowling pin billets and an improved process for manufacturing thereof.

In recent years the manufacture of bowling pins has become an important industry. Normally such bowling pins are manufactured from hard maple and preferably from the white sap-wood found in hard maple logs. These logs are cut into eighteen-inch sections called bowling pin bolts which are then roughly turned in a lathe to form a billet from which the pins are eventually manufactured. Bowling pins are formed with a central belly portion of maximum diameter which is the portion normally subject to impact by the bowling ball or by other pins. It will be understood that bowling pins are subject to terrific punishment in use and after a time they become so battered that they are quite unsatisfactory. Bowlers object to such pins being used and the bowling alley owners often have battered pins refinished to get additional use therefrom. Unfortunately, for league bowling sanctioned by the American Bowling Congress, the bowling pins must conform to certain regulations with respect to weight as well as dimensions. Once the pins have been refinished, which requires some turning down, they usually no longer are regulations pins. Furthermore the battering which conventional pins receive in use makes them unifit for use in a very short period of time.

Many attempts have been made to manufacture bowling pins which would withstand the punishment received in use without requiring periodic refinishing or at least which will stand up under much punishment for much longer periods of time. Attempts for example, have been made to employ pins made from synthetic materials, but to date no satisfactory substitute for the maple bowling pins has been found. Attempts have also been made to densify or harden the bowling pins but these have heretofore also been unsuccessful. In the first place if the bowling pin is hardened it becomes more brittle and the necks of the hardened pins snapped in such a high percentage of cases so that such prior hardening treatment was deemed unsuccessful.

Accordingly it is an object of the present invention to provide a new and improved densified bowling pin billet which will give much longer periods of satisfactory service than any pins used heretofore.

It is another object of the present invention to provide a new and improved process for treating bowling pin billets to form an improved bowling pin.

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Still another object of the present invention is to provide an improved bowling pin billet and an improved process of treating bowling pin billets whereby the period of time without refinishing of pins manufactured from such billets is greatly extended and whereby also even after refinishing of such pins they will still be regulation pins whereby the life of the pins as regulation pins is multiplied several times.

Further objects and advantages of the present invention will become apparent as the following description proceed, and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In accordance with the present invention maple bowling pin billets of standard construction which have been kiln-dried in the conventional manner have the surface thereof densified only over an intermediate belly section including the maximum diameter of the pin, while the remainder of the surface of the billet is maintained in its natural condition. With this arrangement a very hard surface is provided through compressing of the wood fibres in a direction perpendicular to the axis of the billet. This hardened belly surface of the bowling pin eventually manufactured from the billet is the surface which receives the brunt of the punishment during use.

For a better understanding of the present invention reference may be had to the accompanying drawing in which:

Fig. 1 is an elevational view of a standard bowling pin;

Fig. 2 is a similar view of a kiln-dried bowling pin billet prior to being processed in accordance with the present invention;

Fig. 3 is a bowling pin billet processed in accordance with the present invention;

Fig. 4 is a schematic view partly in section illustrating one step in the process of carrying out the present invention; and

Fig. 5 is a somewhat schematic sectional view illustrating another step in the process of forming the new and improved bowling pin billet of the present invention.

Referring now to Fig. 1, there is illustrated a standard bowling pin generally indicated at 10 which is preferably formed of hard maple. Conventionally this pin has a belly portion having a diameter of 4⅝ inches. The bottom of the pin has a diameter of 2¼ inches and the top has a diameter of 2 35/64 inches. This bowling pin 10 is made from a billet shown in Fig. 2 and desig-

nated by the reference numeral 11. The eighteen-inch maple bolts are roughly turned in a lathe to form the billets 11 which are generally manufactured so as to have a diameter of about 5⅝ inches at the belly. The bowling pin billets 11 are kiln-dried over a long period of time so as to prevent checks and splits and to insure uniform shrinkage. Actually the billets are gradually heated in the kiln with the humidity of the heating air gradually reduced over a period of several months. Preferably the ends of the billets are coated with a hot tar or resin as is indicated at 12 and 13 in Fig. 2 of the drawing to insure check-free drying in the kiln. During the kiln-drying process the billets 11 are heated from an initial temperature of 105° F. with the heating air having a humidity of 85 per cent to a temperature of 145 degrees with the humidity of the heating air reduced to 30 per cent. This period during which the temperature is slowly raised takes more than two months and at the end of this period the moisture left in the billets is less than 7 per cent of the billets' total weight.

For the purpose of producing a bowling pin which will stand the punishment inflicted in use for much longer periods of time than standard bowling pins the billets 11 in accordance with the present invention are treated to produce the billet designated as 11' in Fig. 3 of the drawing which comprises the new article of manufacture of the present invention.

The first step in the process of treating the kiln-dried billets 11 to produce the billets 11' comprises culling out undersized billets by employing a suitable ring gauge having an inside diameter of 5½ inches. Any pins that will pass through the 5½ inch inside diameter ring gauge are rejected since there is insufficient stock to permit densifying in accordance with the present invention.

The billets 11 which will not pass through the ring gauge as mentioned above are then immersed in a solution designated at 14 in Fig. 4 of the drawing which is illustrated as being disposed in a suitable tank 15. The solution 14 is preferably one comprising linseed oil, turpentine and a naphtha petroleum solvent having a high flash point. A suitable naphtha petroleum solvent for this purpose may be purchased on the market as APCO #467. It has been found preferable to make the solution 14 of one part of linseed oil, one part of turpentine and six parts of the naphtha petroleum solvent. This solution by virtue of the heat and pressure steps to be described hereinafter penetrates into the surface of the bowling pin billet 11 and tends to soften up the lignin in the wood so as to reduce the pressure required during the densifying step of the process. As illustrated in Fig. 4 a suitable perforated container 16 may be employed for receiving a plurality of billets 11 which container may be lowered from a monorail or similar device generally designated at 17 into the solution 14. When the container 16 is raised out of the tank 15 it preferably is suspended above the solution 14 for a short period of time to permit the excess solution to drain back into the tank 15. In the preferred embodiment, the billets 11 are immersed or soaked in the solution 14 which is preferably at room temperature for a period of the order of one hour and in this time a very limited penetration of the solution into the wood occurs. Preferably a period of the order of forty-eight hours is permitted to elapse after the billets are removed from the solution 14 before the subsequent heat and pressure step described hereinafter is applied. However, when heat and pressure are applied in accordance with such subsequent steps of the process to be described hereinafter, the solution is caused to penetrate deeply into the wood in a matter of a few seconds.

The next step in the process of the present invention preferably comprises coating the belly portions of the billets 11 with a molten wax or similar material to reduce the friction in passing through the pressure die to be described hereinafter, thereby reducing the pressure required and also decreasing the manufacturing loss from tearing or splitting of the billets 11. This step in the process is preferably carried out just prior to the heat and pressure step referred to above. The molten wax may be applied with a paint brush or the like and the wax coating is designated as 19 in Fig. 5 of the drawing.

Referring now to Fig. 5 of the drawing the heat and pressure steps of the process of the present invention are illustrated. In accordance with the present invention there is provided a mold generally designated at 20 which comprises a cylindrical tapered chamber 21. The upper portion of the mold 20 is provided with a heating jacket 22 to define an annular chamber 23 within which a suitable heating fluid may be circulated for maintaining the die at a predetermined desired temperature. As illustrated, the die is indicated with a suitable annular flange 24 at an intermediate portion thereof which may be supported on suitable members 25 forming a part of the press including the ram 26. The die 20 is illustrated as being mounted in a vertical position and the lower end of the die is the outlet thereof which preferably has a diameter of 4¾ inches. The top of the die or entrance portion is provided with a bevel 27 to ease the entrance of an occasional over-sized billet 11. This bevel extends downwardly only a short distance such as about one-half inch below the top of the die and at this point the die preferably has an inside diameter of the order of 5¾ inches.

It should be understood that the die might be jacketed throughout its entire length rather than only partially jacketed as illustrated in Fig. 5. However, it was found unnecessary to jacket the lower portion of the die since it received ample heat by transmission from the upper portion which is jacketed. The over all length of the die which is tapered throughout its length is preferably of the order of 10½ inches or in other words, ten inches below the bottom of the bevel 27.

For the purpose of heating the die to a desired predetermined temperature there is provided a source of hot fluid such as oil or the like schematically indicated at 30 which is connected by means of a conduit 31 to the inlet of the chamber 23 surrounding the tapered chamber 21. A return conduit 32 permits the return of the hot oil or any other suitable fluid to the source 30. A suitable circulating pump, not shown, is preferably provided. Also suitable means, not shown, are provided at the source 30 to maintain the circulating fluid at a predetermined temperature. For the particular application described it has been found that a temperature of 240° F. is very satisfactory since it causes deep penetration of the soaking fluid 14 into the fibres of the billet 11 to aid in densifying the same.

In view of the fact that the billets 11 have more wood stock toward the bottom than toward the top the billets 11 are preferably forced

through the die or mold **20** head first as is clearly indicated in Fig. 5 of the drawing. The ram **26** under a pressure of between eighteen and twenty-six tons and an average pressure of about 22 tons, forces the billet **11** through the die densifying the billet in the belly area generally designated at *11'a* in Fig. 3 of the drawing to form the billet **11'**. This belly area which extends in the neighborhood of 4 inches or so in the longitudinal direction of the billet is the area which eventually receives the major punishment when the bowling pins manufactured therefrom are used. The billets **11'** are then processed in the conventional manner to form the bowling pins **10**. This finishing process comprises turning the tops and bellies to the correct diameter, sanding the pin surface to a smooth finish, and lacquering and labeling the pins.

Upon emerging from the bottom of the die **20** the billets **11'** are greatly compressed since the belly must pass through the 4¾ inch throat of the die. However, upon emerging from the die a slight expansion occurs so that the bellies have an average diameter of about $4\frac{15}{16}$ inches. There is, therefore, ample excess diameter to permit easy centering of the billet by the lathe operator who makes the final cuts on the billet **11'** to produce the bowling pin **10** therefrom.

In view of the detailed description included above the carrying out of the process will be well understood by those skilled in the art and a new and improved article of manufacture in the form of a processed bowling pin billet from which greatly improved bowling pins may be formed is produced. The surfaces of the pins in the belly portion which receives the main brunt of the battering when embodying the present invention are much harder than conventional bowling pins and many tests have been made by striking a conventional bowling pin with a pin made in accordance with the process described above and in every case no marring or denting of the surface of the processed pin was evident, while a large bruise or mar was produced on the conventional pin. These tests and extensive tests with respect

to actual use of the pins processed in accordance with the present invention indicate a vast improvement and the solution of a long felt need.

While there has been illustrated and described a preferred embodiment of the present invention and a new and improved process for producing the same, it will be understood that changes and modifications with respect thereto will occur to those skilled in the art. It is intended in the appended claim to cover all such changes and modifications as fall within the true spirit and scope of the present invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

The process of treating a bowling pin billet of a size which will not pass through a ring gauge having an inside diameter of 5½ inches which comprises soaking a kiln-dried billet for a period of the order of one hour in a solution comprising linseed oil, turpentine and a naphtha petroleum solvent, coating the belly of said billet with a molten wax, and immediately thereafter forcing said billet through a tapered die having a minimum diameter of the order of 4¾ inches to densify the surface of an intermediate portion only of said billet while simultaneously heating said die to a temperature of the order of 240° F.

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