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METHOD OF MAKING OR REPAIRING A BOWLING PIN

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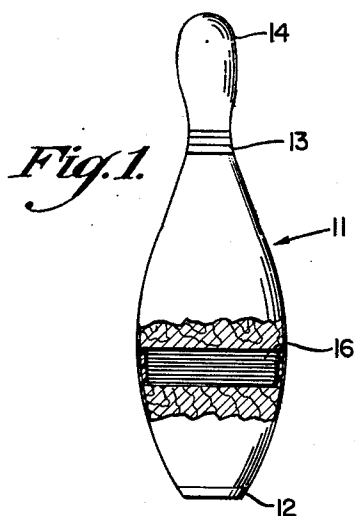
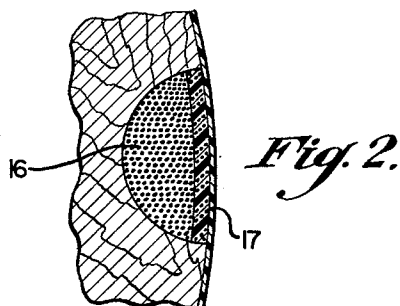
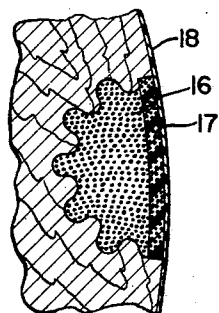


*Fig. 3.*

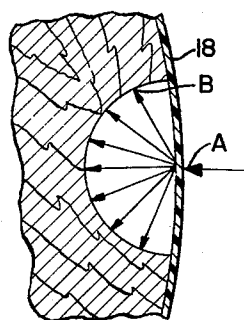


*Fig. 4.*

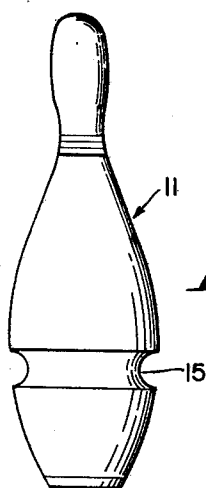


*Fig. 5.*

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## METHOD OF MAKING OR REPAIRING A BOWLING PIN

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The present invention relates to bowling pins. In particular, the present invention relates to a method of forming bowling pins having means therein to prevent excessive deformation of the pin in the ball contact zone.

In recent years, there has been a tremendous increase in activity in the bowling industry. This has been brought about primarily by the introduction of automatic pin setting equipment which eliminates the need for boys to act as pin setters. This makes it possible to operate bowling alleys on a 24-hour basis to accommodate people who ordinarily work at night and play in the day, and people who work during the day who would like to play in the evening or late at night. While much progress has been made in the pin setting equipment field, there has been surprisingly little progress in the improvement of the bowling pins themselves. In other words, for the most part, the bowling pins employed by the majority of alleys throughout the United States are of the same type which are produced by the same method as they have been produced for many years prior to the advent of automatic pin setting equipment. Since bowling alleys are used much more frequently than heretofore, the bowling pins employed undergo much more action. Additionally, many more bowling pins have of necessity been produced to accommodate the increase in the number of players and in the increase in the number of alleys.

While a bowling pin manufactured from either solid wood or a laminated wood product is a fairly hard object, it can only withstand so much continued impact from a fast moving bowling ball having considerable mass. Due to the structure of the bowling pin, the bowling ball strikes only a relatively small peripheral annular area on the pin known as the contact zone. As this zone is continually struck by a bowling ball, there is considerable deformation of the pin in this area which after a while makes it useless as a pin due to the fact that it takes on unexpected gyrations when struck by a bowling ball, so that the pin does not show the same activity as when it was new and was not deformed.

The prior art is replete with a number of proposals for increasing the life of a bowling pin. Specifically, one method comprises cutting a recessed annular ring in the widest portion of a bowling pin. The groove is then filled by winding plastic impregnated twine into the groove. A suitable smooth facing is provided about the periphery of the pin along the filled area. Due to the use of plastic impregnated twine, the filled portion acts as a solid collar which becomes loosened when the bowling pin is put into use and later becomes fractured or fractures the body of the pin itself due to poor distribution of stresses set up by the impact of the bowling ball.

Accordingly, it is a primary object of the present invention to disclose a bowling pin in which the effective life of the pin is materially increased over the pins heretofore produced.

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It is another object of the present invention to disclose a method of forming a bowling pin in which the effective life of the pin is materially increased by reducing the possibility of damage that is possible to the pin.

It is still a further object of the present invention to provide a method of forming a bowling pin wherein a pin damaged beyond use in normal bowling may be restored to full usefulness.

Another object of the invention is to provide a method of manufacturing and refinishing bowling pins which is easy to perform, inexpensive, and which will produce a bowling pin having an effective life greater than a new bowling pin manufactured in the prior art manner.

These, together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation of the method as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts, and in which:

FIGURE 1 is a front elevation of a bowling pin of the present invention shown partially broken away for clarity of illustration.

FIGURE 2 is an enlarged vertical cross section of a fragment of the invention.

FIGURE 3 is an enlarged vertical cross section of a fragment of another embodiment of the invention.

FIGURE 4 is a diagrammatic vertical cross section showing lines of force as applied to the contact zone by a bowling ball.

FIGURE 5 is a side elevation of a bowling pin with the first step of the invention carried out thereon.

Now, turning to the drawings for a detailed consideration of the invention, the reference numeral 11 indicates, generally, a bowling pin constructed in accordance with the present invention. The bowling pin comprises usually a maple wood body, a base 12, a neck portion 13 and a head 14. The generally cylindrical configuration of the bowling pin 11 is conventional and is rigidly controlled by the organized bowling associations and leagues.

In use, the wooden body of the bowling pin 11 is struck by the bowling ball in that peripheral area of the body 11 which has the largest diameter, thereby sustaining damage along this area. It will be appreciated that sustained impact of the bowling ball produces a considerable amount of damage so that the configuration of the bowling pin no longer meets the bowling association standards. Therefore, the pin can no longer be used in the games sponsored by the organized associations. As was stated in the above, a bowling pin may sustain such a degree of damage that the expected activities thereof are no longer attainable and predictable.

In order to produce the bowling pin of the present invention, a pin body 11 is placed in a lathe arrangement. The pin body may be a new one or it may be a used and damaged pin. An annular groove 15 is cut therein in that portion of the pin body 11 having the greatest diameter. The configuration of the groove 15 can be seen clearly from FIGURE 5. It will be observed that the annular groove is generally a semi-spherical cavity. After the pin body 11 has been suitably recessed at 15, a plurality of layers of a monofilament material 16 is wound thereabout. This monofilamentous material is wrapped in the recess 15 of the pin 11 while under considerable tension. This may be accomplished by maintaining the

bowling pin in the lathe and by paying off from a suitably positioned reel the monofilamentous material while maintaining the reel under tension by urging it away from the bowling pin while it is locked in the lathe. By employing a fairly small diameter monofilamentous strand, it is possible to line the recess 15 with a considerable number of layers. Preferably, the layers are wound so that they are zigzag much in the manner that a ball of string is wound. This may be accomplished by reciprocating the source of the monofilamentous material longitudinally to the pin as the pin is rotated. The monofilamentous material is preferably a monofilament produced from a synthetic resin such as nylon or it may be a single strand of a metal wire, such as a steel wire. It will be appreciated that due to the unique configuration of the groove 15, the greatest number of strands or the greatest thickness through the groove will be at that portion of the pin having the greatest diameter, thereby giving the greatest strength characteristics at the very point of impact by the bowling ball. The laying down of the monofilament or steel wire is continued until substantially the major portion of the groove is filled. In order to lock the filaments in place and to prevent unwinding thereof, it has been discovered that the strands that are to go into the uppermost portion of the groove should be coated with a plastic material which when cured, forms a laminate 17 with the strands embedded therein. Therefore, the combination of winding the filament while under considerable tension and locking the filaments by lamination with resinous material, a filling of the groove 15 is accomplished which is prevented from being dislodged therefrom by subsequent bowling ball impact.

The resinous materials applicable in the coating of the monofilament may be polycarbonates, polyesters or epoxy polymers. In order to coat the monofilament, the strand may be passed through the resin which is in a fluid condition, just prior to its being wound into the groove 15. When the groove 15 is suitably filled, the laminate portion 17 is permitted to solidify or harden to effect a locking effect of the plurality of layers 16 which do not have a plastic coating thereon. Another method for coating the outermost layers includes coating the layers with a composition consisting of a powdered resin and finely divided metallic particles. The coating of the strand may be accomplished by first applying a small quantity of an adhesive thereto, after which the strand is passed through a bed containing the powdered resin-metallic particles composition. After the coated layers have been properly positioned, the powdered resin is momentarily liquified by subjecting the coated layers to induction heating which may be achieved by a conventional high frequency generator. Thereafter the resin is permitted to cool and harden thereby forming a unique laminate. In the method, when the resin is employed while in a fluid condition, the resin may be dissolved in a suitable solvent and the strand may be passed therethrough. Hardening is then achieved by permitting the solvent to evaporate.

After locking the wound filament in the groove 15, the entire bowling pin is given a coating with a suitable plastic material in order to finish the pin. The pin may then be given a suitable polishing or buffing operation as desired.

It will be noted from FIGURE 2 that the groove has a general semi-spherical configuration, while in FIGURE 3, another embodiment is disclosed. This latter embodiment, while defining a configuration where the greatest depth of the groove 15 is along a median line, the decreasing depth is somewhat convoluted. In either case, however, the important principle to be observed is the fact that the greatest depth of the groove is along the median line. This principle along with the present teaching that the inner wound layers are wound under tension but are not laminated produce a bowling pin having exceptional wearing qualities. Furthermore, due

to the diagonally wound layers of the preferred embodiment, the strand of each layer is prevented from becoming compacted into a too solid unitary structure.

Attention is now directed to FIGURE 4 wherein a force pattern is shown to illustrate the distribution of stress lines due to the impact of a bowling ball at A. It will be seen that the impact is distributed by the layers of monofilamentous material from point A to the interface of the bowling pin proper with the layers in the groove at a plurality of points B. The general semi-spherical configuration of the groove provides a bowling pin surface in the groove which is generally equidistant from impact point A. The prior art bowling balls that include groove portions have a flat surface. Furthermore, the material with which the groove is filled presents a hard laminate. In such an arrangement the impact of a bowling ball at A produces a stress in a continuing straight line in the same plane which is then carried to the interface without diminution by being distributed over a wider area. Since the laminate in prior art bowling pins acts as a single unit, it is subject to dislodgment due to repeated impacts by bowling balls or by variations in dimensions over a period of time due to temperature and humidity condition.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed is:

1. The method of producing and finishing a bowling pin which comprises producing an annular groove in the ball contact zone of a bowling pin, winding a monofilament strand into said annular groove to a height to partially fill the groove with a plurality of layers, further winding a monofilament strand coated with a plastic material in a fluid state into said groove to fill the remainder of the groove, hardening the plastic coated monofilament winding thereby producing a laminate which retains the first wound monofilament in position, coating the pin and filled groove with a plastic material and finishing the pin to standard bowling pin contours.

2. The method of producing and finishing a bowling pin which comprises producing an annular groove in the ball contact zone of a bowling pin, winding a monofilament strand into said annular groove while under tension to a height to partially fill the groove with a plurality of layers, further winding a monofilament strand coated with a plastic material in a fluid state into said groove to fill the remainder of the groove, hardening the plastic coated monofilament winding thereby producing a laminate which retains the first wound monofilament in position, coating the pin and filled groove with a plastic material and finishing the pin to standard bowling pin contours.

3. The method of claim 2 wherein the annular groove is deepest into the bowling pin along the median line of the groove and is of ascending less depth on each side away from the median line.

4. The method of claim 3 wherein the groove is of continuously ascending less depth on each side away from the median line.

5. The method of producing and finishing a bowling pin which comprises producing an annular groove in the ball contact zone of a bowling pin, winding a monofilament strand into said annular groove while under tension to a height to partially fill the groove with a plurality of layers, further winding additional monofilament strand into said groove to fill the remainder of the groove, coating said additional monofilament strand with a finely divided composition comprising a plastic material and metallic particles, thereafter heating the composition by

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induction heating whereby to soften the plastic material to fill the interstices of the additional windings, cooling the composition, the plastic coated monofilament winding thereby producing a laminate which retains the first wound monofilament in position, coating the pin and filled groove with a plastic material and finishing the pin to standard bowling pin contours.

6. The method of claim 5 wherein the annular groove is deepest into the bowling pin along the median line of the groove and is of ascending less depth on each side away from the median line.

7. The method of claim 6 wherein the groove is of continuously ascending less depth on each side away from the median line.

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