

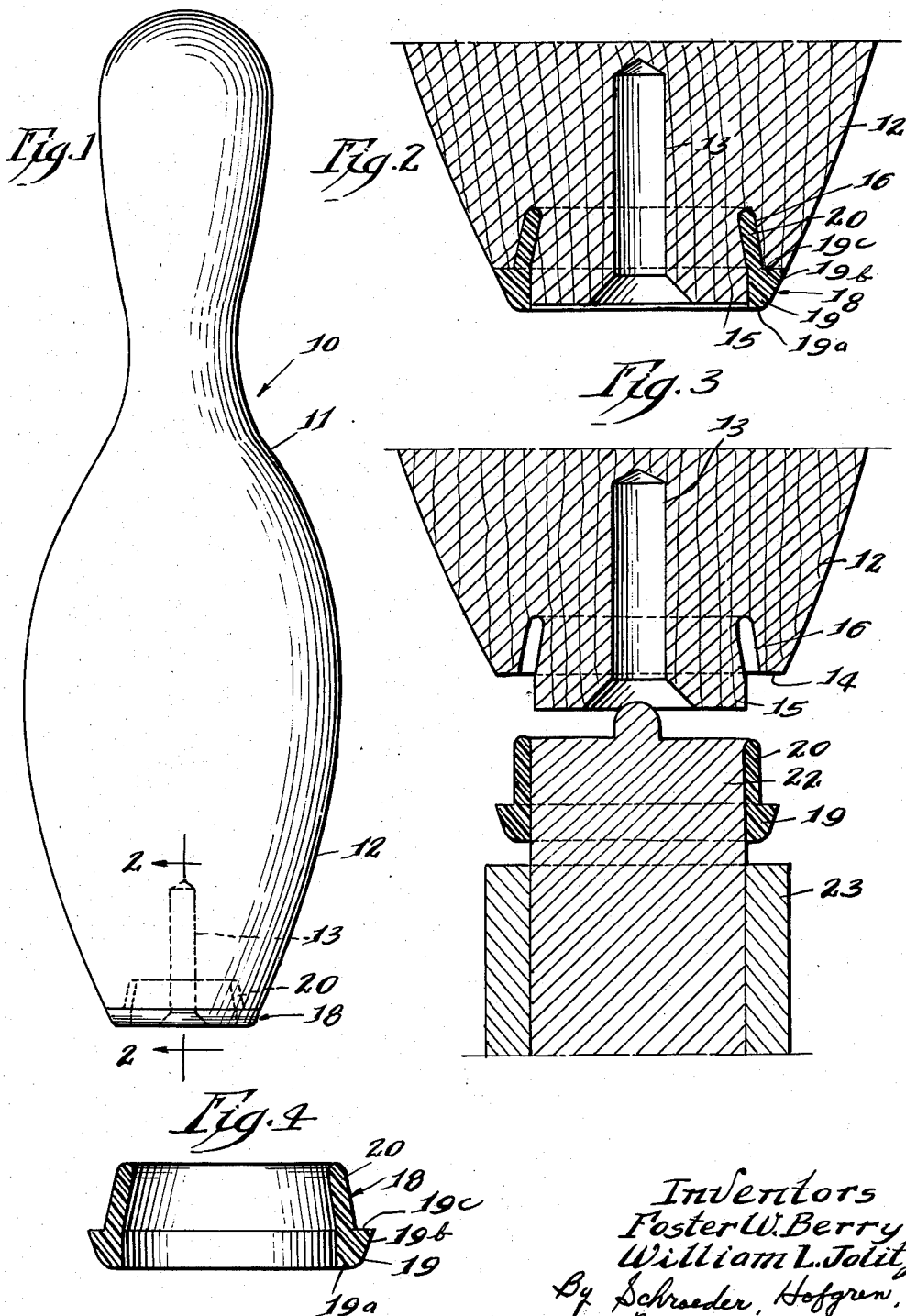
Dec. 13, 1960

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2,964,319

BOWLING PINS

Filed Feb. 13, 1958



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2,964,319

BOWLING PINS

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Filed Feb. 13, 1958, Ser. No. 715,110

2 Claims. (Cl. 273—82)

This invention relates to bowling pins and has for a general object the provision of a new and improved pin having a wear and impact resistant pin bottom or base insert.

In use, bowling pins are subjected to considerable wear and battering due to repeated impact with bowling balls and repeated collision with other pins. One of the pin areas most susceptible to damage and rapid deterioration due to such impacts is the base or bottom end of the pin, particularly the bottom edge or corner of the pin. For years, pins have been constructed of wood, and the rapid deterioration of the bottom pin edges of such material has represented a serious problem since it is imperative that certain minimum standards of pin condition be maintained in order that the pins will stand properly and give the desired pin action. In the past, this has required replacement or repair of pins after relatively short periods of use, resulting in a heavy economic burden.

As a result, efforts have long been made to provide a pin bottom having physical characteristics acceptable to the American Bowling Congress, and having suitable physical characteristics to provide prolonged pin life. One of the most common solutions attempted has been the use of inserts at the base of the pin designed to give a longer period of pin life than was provided by pins made solely of wood. However, difficulty has been encountered in developing an insert of acceptable material which would have the desired wear and impact resistance properties, and which was suitably attached to the pin body to give prolonged pin life.

With the above and other considerations in mind, it is a more specific object of the present invention to provide a new and improved bowling pin having a pin bottom or base insert of plastic material acceptable to the American Bowling Congress, having improved wear and impact resistant properties, which may be simply and economically manufactured, which may be easily applied to pin bottoms, which is securely retained in position for prolonged periods of use without the aid of adhesives, and which may be removed for reuse or for replacement.

Another object is to provide a new and improved bowling pin having a premolded ring shaped insert of wear and impact resistant plastic at the base of the pin including a ring shaped body portion forming the base corner of the pin, and a locking ring upstanding on the bottom portion and having a uniform thickness and a conical inclination fitted in a complementary groove formed in the pin body to receive and house the locking ring without deformation of the ring from its premolded shape.

Other objects and advantages will become readily apparent from the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a side elevational view of a bowling pin embodying the principles of the present invention;

Fig. 2 is an enlarged fragmentary sectional view through the base portion of the pin illustrated in Fig. 1, taken at about the line 2—2 of Fig. 1;

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Fig. 3 is a fragmentary sectional view through the center of a pin, an insert, and an applying apparatus, illustrating a method of applying the insert to the pin; and

Fig. 4 is a sectional view through the center of an insert constructed according to the principles of the present invention.

While an illustrative embodiment of the invention is shown in the drawings and will be described in detail herein, the invention is susceptible of embodiment in many different forms, and it should be understood that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

Referring now to the drawings in more detail, in a preferred construction, the invention is embodied in a bowling pin 10 including a main body 11 and a base portion 12 tapering toward the butt end of the pin and having a central bore 13 for use in locating the pin properly on a bowling alley. In order to attach a pin bottom or base insert according to the invention, the base portion 12 is turned down, as on a lathe, as illustrated at 14, to leave a central cylindrical shank 15 at the butt end of the pin of reduced diameter relative to the remaining, tapering side surface of the base portion. A concentric annular groove 16 is provided in the base portion, extending upwardly from the shank 15 to a predetermined depth. The groove is of uniform width and is conically inclined upwardly and toward the center axis of the pin.

The shank 15 and the groove 16 provide a means for mounting a pin bottom or base insert 18 which includes a ring shaped base 19 and a locking ring 20 upstanding on the base. The base 19 is adapted to fit on the shank 15 and includes a bottom surface 19a which forms the bottom surface of the pin and a side surface 19b tapering upwardly from the bottom surface and forming a continuation of the tapering side surface of the base portion of the pin body after the insert is applied to a pin. The locking ring 20 is formed to fit the groove 16.

The insert 18 is premolded, as illustrated in Fig. 4, in a shape intended to closely fit the shank 15 and the groove 16 at the bottom of the pin body. Thus, the premolded inner diameter of the base 19 corresponds to the outer diameter of the shank 15. The locking ring 20 has a premolded thickness, height, and inclination corresponding to the width, depth and inclination of groove 16 so that, when positioned as illustrated in Fig. 2, the insert is effectively retained in position due to the inclination of the groove and locking ring without any residual stress in the insert and without deformation of the insert from its premolded shape.

The insert may be easily applied to the previously prepared base portion of a pin, as illustrated in Fig. 3, by first placing the insert on a mandrel 22 having a diameter comparable to the diameter of the shank 15. After the mandrel is moved against the bottom of the pin, a surrounding pusher sleeve 23 may be moved upwardly on the mandrel to force the insert off the mandrel and onto the shank. As the locking ring enters the groove 16, it returns to its premolded shape, conforming to the shape of the groove. Adhesives are not required or beneficial in retaining the ring in position, as the ring is securely locked and remains in place over extended periods of intense use of the pin in bowling. While the insert is locked against removal during normal usage, it may be removed for reuse on other pins by the application of suitably directed forces.

In a preferred embodiment, utilizing an insert of the type described on a tenpin, the insert has a size and shape

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substantially as illustrated in Figs. 2 and 4, these figures being drawn substantially to actual scale. In the preferred embodiment, the base 19 of the insert has an inner diameter of $1\frac{13}{16}$ ", the outer diameter of the flat bottom surface 19a is 2", and the height of the base is $\frac{5}{16}$ ". The shoulder at 19c is $\frac{5}{32}$ " wide, and the tapering side surface 19b conforms to the standard set by the American Bowling Congress. The thickness of the locking ring 20 and the width of the groove 16 are $\frac{5}{32}$ ", the height of the locking ring and groove are $\frac{9}{16}$ ", and the locking ring and groove are inclined 10° from the vertical.

The insert 18 is constructed of a relatively rigid material, preferably a plastic material, which is not compressible in the common sense of the word during normal use of the pin including impact with balls and other pins, as compressibility would destroy the effectiveness of the insert, enabling damage to the wood portion of the pin. The material utilized preferably should be acceptable to the American Bowling Congress, as nearly resembling wood as possible, so as not to alter the pin scoring and play qualities from the set standards. Suitable materials have an Izod impact notched rating greater than 1 foot pound per inch, a tensile strength of 3,000 lbs. or greater, a Scleroscope hardness rating of 30-65, a Rockwell R hardness number not exceeding 105, a durometer Shore D hardness not exceeding 65, a compressive stress at 1% deformation of 750 to 2,000 pounds per square inch, a modulus of flexure between 75,000 and 158,000 pounds per square inch, and an elongation at yield of 5 to 20%. Specific materials which have been found suitable include polyamide type resins such as nylon, polymerization products of low molecular weight hydrocarbons such as linear polyethylene, and modified polystyrene type copolymers.

According to the invention, the materials utilized for the insert 18 are acceptable to the American Bowling Congress and do not alter the pin scoring and play qualities from the standards set by the Congress. The design dimensions of the insert also fall within the requirements of the American Bowling Congress rules. The insert as illustrated is of moderate section, minimizing added weight and any effect on the pin balance. The shank 15 and the groove 16 for retaining the insert are easily machined without the need for special tooling and the groove 16 need not be machined precisely. The insert is of simple design, adapted to simple molding procedures, yet it is of rugged configuration, without delicate projections or undercuts which could be easily damaged during insertion or during use.

No heating, as by spinning or other means, and no other preinsertion treatment of the insert is required. No adhesives are necessary or beneficial in retaining the insert on the pin, and no curing or post-insertion treatment is required. Deformation of the insert 18 when applied to the mandrel 22 is below the yield point of the locking ring 20. The material of the insert is not compressible in the ordinary sense of the word and no compression is required, as would be necessary to insert a locking portion in an undersize recess.

After insertion, the insert is in full contact with supporting and mutually supported wood portions of the pin, without voids or cavities in any plane or section. The insert 18 is effectively retained in place due to the inclination of the locking ring and groove in which it is seated. The retention element, the locking ring 20, is imbedded in and protected by the pin body in areas

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which are removed from pin areas that are compressed during use of the pin. Any compression of the wood from use and any shrinkage due to drying improves the retention qualities of the insert. Secondary locking rings or other locking devices are not required, the one-piece insert being self-locking. The insert is free from residual stress and is not displaced or deformed from its molded shape. During use, the pin bottom insert has proved fully effective, retaining the desired pin bottom dimensions and edge radius over prolonged periods. And while the insert is securely retained against accidental or other undesired removal during normal use, it may be removed for reuse or replacement, if desired.

We claim:

1. A bowling pin, comprising, in combination, an elongated main body including a base portion tapering inwardly toward its butt end and having a central cylindrical shank at the butt end of reduced diameter relative to the remaining, tapering base portion, said base portion having a concentric annular groove extending upwardly therein from the shank, said groove having a uniform width throughout defined by parallel side walls equally spaced from each other throughout, having a predetermined depth defined by a top wall connecting the tops of said side walls, and being inclined conically upwardly and toward the center axis of the pin, and a premolded wear and impact resistant continuous ring-shaped insert of relatively rigid plastic material removably attached to said base portion including a base surrounding said shank and including an annular bottom surface forming the bottom surface of the pin and a tapering side surface extending upwardly from the bottom surface and forming a continuation of the tapering side surface of said base portion, said insert including an upstanding locking ring on the base fitted in said groove, the premolded inner diameter of said base corresponding to the outer diameter of said shank, and said locking ring having a premolded uniform thickness, height and inclination corresponding to the width, depth and inclination of said groove and being disposed in the groove in an undeformed state so that the insert is effectively retained in place on the base portion of the main body, filling said groove, with no deformation of the insert from its premolded shape and without residual stress in the insert, said plastic material being substantially incompressible during normal use of the pin and being sufficiently elastic to enable insertion of said locking ring in and removal from said annular groove without rupture.

2. A bowling pin as defined in claim 1, wherein said plastic material comprises a nylon having an Izod impact notched rating greater than 1 foot pound per inch, a tensile strength of at least 3000 lbs., a Scleroscope hardness rating of 30-65, a Rockwell R hardness number not exceeding 105, a durometer Shore D hardness not exceeding 65, a compressive stress at 1% deformation of 750 to 2000 pounds per square inch, a modulus of flexure between 75,000 and 158,000 pounds per square inch, and an elongation at yield of 5 to 20%.

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