A softball or baseball bat comprising a plurality of strips of wood assembled to form a solid material is disclosed. The bat can comprise bamboo, or other suitable material, that provides the necessary hardness, while using a more economical and renewable resource than conventional hardwoods. The plurality of strips can be assembled to form a solid block, which can be shaped into a bat blank. Then, blank can comprise a handle portion, a transition portion, and a barrel portion. The bat can further comprise a reinforcing sleeve disposed proximate the handle portion and the transition portion. The finished bat can further comprise a protective and decorative coating.
Fig. 5

1. Cut Wood into Strips
2. Assemble Strips into Blocks
3. Shape Blocks into Bat Blank
4. Apply Wrap to Handle/Taper
5. Adhere Wrap to Handle/Taper
6. Cure Wrap
7. Final Shaping/Sanding
8. Paint
9. End
BAT WITH REINFORCING WRAP

CROSS REFERENCE TO RELATED APPLICATIONS


BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates generally to bats for use in baseball and softball and specifically to bats comprising renewable woods with reinforcing components.

[0004] 2. Background of Related Art

[0005] Conventionally, bats have been made out of hardwoods such as, for example, maple, birch, and ash. These woods provide good durability and reasonable cost of manufacture. The hardness of the wood also provides good restitution characteristics (e.g., the bat is able to impart a significant amount of energy to the ball rather than that the energy simply being absorbed by the bat).

[0006] Because of their hardness, however, hardwoods are used in a wide variety of applications. Hardwoods are used in everything from baseball bats to furniture to flooring. Unfortunately, a significant factor that causes hardwoods to be hard is that hardwood trees grow slowly. This slow growth process creates a tree with tight grain (i.e., growth rings), which provides great strength and relatively high density. Unfortunately, this slow growth means that current demand is outstripping the ability to regrow hardwood forests. In addition, hardwood trees can only be harvested once. In other words, once a hardwood tree is cut down, it does not grow back, and a new tree has to be planted in its place. The overharvesting of hardwoods around the world results in deforestation, loss of species, loss of habitat, and other environmental issues.

[0007] Other materials, such as aluminum and plastic composites, can be used to produce baseball bats. Aluminum bats, for example, are common in collegiate baseball and softball and can be tuned to meet a variety of performance specifications. Aluminum bats are banned from professional baseball; however, for a number of reasons. One reason is that professional players are able to generate very high bat speeds. High bat speeds, combined with the improved restitution of an aluminum bat, creates dangerously high ball speeds. This can not only result in injury to players (especially the pitcher), but is also thought to take some of the skill out of the game. Another reason is that baseball is somewhat a game of nostalgia and has simply always used wooden bats in the major leagues. As a result, the league is reluctant to deviate from tradition.

[0008] What is needed, therefore, is a bat comprising a renewable resource that has equivalent or superior physical characteristics when compared to conventional hardwood bats. It should be economical to manufacture and provide good restitution and durability. It is to such a bat that embodiments of the present invention are primarily directed.

SUMMARY OF THE INVENTION

[0009] Embodiments of the present invention relate to a baseball or softball bat with a wooden core and a reinforcing wrap. The bat can comprise conventional features including a barrel portion, a transition portion, a handle portion, and a knob. In some embodiments, the wooden core can comprise a renewable material such as bamboo. The core can comprise a plurality of bamboo strips glued and/or pressed together to form a substantially monolithic block. In some embodiments, the block can be shaped to form a bat blank by, for example and not limitation, a lathe or a CNC machine.

[0010] The bat can further comprise a reinforcing sleeve disposed proximate the handle portion, the transition portion, or both. In some embodiments, the reinforcing sleeve can comprise nylon, plastic, fiberglass, or other suitable fibers. In a preferred embodiment, the reinforcing sleeve can comprise a woven fiberglass sleeve. The reinforcing sleeve can be adhered to the bat using, for example and not limitation, epoxy resin.

[0011] Embodiments of the present invention can also comprise a method of manufacturing a bat. A plurality of strips of wood, such as bamboo, can be glued and/or pressed together to form a substantially solid block. The block can be shaped, for example, using a lathe or a CNC machine to form a bat blank. A reinforcing sleeve can be adhered to the bat proximate the handle portion and the transition portion. The reinforcing sleeve can be air and/or heat dried. The bat can be sanded and finished to produce a smooth surface. The bat can be coated with a protective coating such as, for example and not limitation, polyurethane. In some embodiments, the bat can further comprise one or more stickers or labels.

[0012] Embodiments of the present invention can comprise a bat system comprising a bat blank, having a barrel, a taper, a handle, and a knob, and formed from a plurality of wooden strips glued together to form a unitary blank and a reinforcing sleeve, comprising a plurality of reinforcing fibers disposed at an acute angle to the longitudinal axis of the bat, disposed proximate the taper, the handle, or both, reinforcing the bat. In some embodiments, the reinforcing sleeve can comprise fiberglass adhered to the bat blank with resin. In this configuration, the resin can comprise, for example and not limitation, polyester resin or epoxy resin. In other embodiments, the reinforcing sleeve comprises pre-impregnated carbon fiber.

[0013] In some embodiments, the wooden strips can comprise strips of, for example and not limitation, ash, oak, maple, birch, or bamboo. In some embodiments, the acute angle can be between 15 degrees and 60 degrees. In other embodiments, the acute angle can be 45 degrees.

[0014] Embodiments of the present invention can also comprise a method of manufacturing a bat comprising applying adhesive to a plurality of wooden strips, assembling the wooden strips into a unitary wooden block, shaping the unitary wooden block into a rough bat blank comprising a barrel, taper, handle, and knob, placing a reinforcing sleeve over the bat blank proximate the taper, the handle, or both, adhering the reinforcing sleeve to the bat blank with a resin, and curing the resin to harden the reinforcing sleeve. In some embodiments, the reinforcing sleeve can comprise a plurality of reinforcing fibers disposed at an acute angle to the longitudinal axis of the bat.

[0015] In some embodiments, the method can further comprise shaping the bat blank with reinforcing sleeve into a final bat blank, and sanding the surface of the final bat blank to provide a smooth surface. In other embodiments, the method can further comprise painting the sanded final bat blank. In still other embodiments, the method can further comprise applying decals to the final bat blank.

[0016] In some embodiments, shaping the unitary wooden block can be performed on a lathe. In some embodiments, the
method can further comprise compressing the plurality of wooden strips after assembly (e.g., in a hydraulic press). In some embodiments, the adhesive applied to the plurality of wooden strips prior to assembly can be epoxy resin. In some embodiments, the reinforcing sleeve can comprise, for example and not limitation, fiberglass, Kevlar®, or carbon fiber. In some embodiments, the method can further comprise vacuum bagging the bat blank and reinforcing sleeve prior to curing.

These and other objects, features and advantages of the present invention will become more apparent upon reading the following specification in conjunction with the accompanying drawing figures.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 depicts a perspective view of a bamboo bat with a fiber reinforcement sleeve, in accordance with some embodiments of the present invention.

FIG. 2 depicts a top view of the bamboo bat with a fiber reinforcement sleeve of FIG. 1, in accordance with some embodiments of the present invention.

FIG. 3 depicts a bottom view of the bamboo bat with a fiber reinforcement sleeve of FIG. 1, in accordance with some embodiments of the present invention.

FIG. 4 depicts a perspective view of the fiber reinforcement sleeve prior to installation, in accordance with some embodiments of the present invention.

FIG. 5 is a flowchart depicting a method of manufacturing a bamboo bat with a fiber reinforcement sleeve, in accordance with some embodiments of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Embodiments of the present invention relate to a baseball or softball bat, and more specifically to a baseball or softball bat assembly comprising a renewable wooden core and a reinforcing sleeve. In some embodiments, the core can comprise a substantially rigid, renewable wood material such as, for example and not limitation, bamboo. The core can have a barrel portion, a transition portion, and a handle portion. In some embodiments, the handle portion can further comprise a knob.

The bat assembly can further comprise a reinforcing sleeve. The sleeve can comprise, for example, nylon, polypropylene, cotton, or fiberglass. In some embodiments, the sleeve can be adhered to the transition portion, the handle portion, or both. In some embodiments, the sleeve can comprise a composite material with a matrix and a reinforcing fiber, such as fiberglass. The materials, dimensions, and thicknesses, among other things, of the sleeve and the core, can be manipulated to change the characteristics of the bat.

To simplify and clarify explanation, the system is described below as a bat system comprising bamboo and fiberglass. One skilled in the art will recognize, however, that the invention is not so limited. The system can also comprise other woods such as, for example and not limitation, ash, walnut, oak, teak, maple, and pine. Furthermore, while the system comprises a reinforcing wrap generally referred to below as a fiberglass, other composite materials including, but not limited to, carbon fiber and Kevlar® could be used.

In addition, various assembly and adhesive techniques are described, but other suitable methods are contemplated.

The materials described hereinafter as making up the various elements of the present invention are intended to be illustrative and not restrictive. Many suitable materials that would perform the same or a similar function as the materials described herein are intended to be embraced within the scope of the invention. Such other materials not described herein can include, but are not limited to, materials that are developed after the time of the development of the invention.

As described above, a problem with conventional hardwood bats is that they are manufactured from non-renewable resources. In other words, because of the demand for hardwoods to manufacture bats and other products, hardwood forests are being depleted more quickly than they can be replanted and regrow. Many hardwoods take 100 years or more to grow to a reasonable size. As a result, in addition to the obvious environmental issues this overuse poses, the cost of hardwood continues to rise. At the same time, due to the internet and other factors, sellers are under constant pressure to offer high quality products at reduced prices. These factors result in hardwood bats selling at higher prices than comparable aluminum or composite bats, but at a lower profit margin.

What is needed, therefore, is a bat system, and method for manufacturing the bat system, utilizing plentiful, renewable resources to form a bat that has similar characteristics to a conventional hardwood bat, but at reduced cost and reduced environmental impact. It is to such a bat and method that embodiments of the present invention are primarily directed.

As shown in FIGS. 1-3, embodiments of the present invention can comprise a bat system 100 formed from a plurality of wood strips 105 glued together to form one unit 100. The wood strips 105 can comprise hardwoods such as, for example and not limitation, ash, maple, or oak. Because strips 105 are used, however, remnants and other low cost materials, that may otherwise be discarded, can be used to produce bats. The portions of wood removed during the cutting and shaping of furniture components, for example, can be used to create bats instead of being discarded or ground into sawdust, for example.

In some embodiments, the bat 100 can be formed from a plurality of bamboo strips 105. Bamboo is a favorable material in that it is a grass and can be harvested multiple times without killing the plant itself. In other words, like the grass in a yard, for example, bamboo can be cut and the plant will simply grow back. This obviates the need to remove the “stump” and replant, as is required with conventional hardwood materials. In addition, bamboo is very fast growing with some varieties growing up to 2 feet per day in warm, humid climates. Mature bamboo, and particularly the outer layers thereof, can also have hardness equal to, or greater than, many hardwood species.

One problem with bamboo, however, is that it is hollow. As a result, using even a large stalk of bamboo would lead to a hollow bat with very poor characteristics. As shown, therefore, it is desirable to cut the bamboo into strips 105 and then glue them together to form a solid material. In some embodiments, therefore, the bamboo can be cut into strips 105. The strips 105 can be, for example and not limitation, square or rectangular to enable them to be assembled into a block. The strips 105 can then be glued together using a suitable adhesive (e.g., epoxy resin). In some embodiments, the strips 105 can be placed under pressure and/or heated to facilitate the gluing process.

The strips 105 can be assembled to form a substantially solid block of wood; much like layers of wood are
assembled to form a solid sheet of plywood. After assembly, the solid block can be shaped (e.g., using a lathe or a CNC milling machine) into a bat 100. The bat 100 can comprise a barrel portion 110, a taper portion 115, and a handle portion 120. In some embodiments, the handle portion 120 can further comprise a knob 125 to prevent the bat 100 from slipping out of the user’s hand.

In other embodiments, the individual strips 105 can be shaped to form one or more configurations. The center of the bat 100, for example, can be assembled with relatively square or rectangular strips, while the outer areas of the bat 100 can be shaped to create, for example, the rounded shaped necessary for the barrel 110 of the bat 100. In still other embodiments, the strips 105 can be glued and/or pressed in a forming die, for example, to provide the desired shape using pressure and/or heat. In this manner, areas of extra strength can be provided such as in the hitting area 130, or “sweet spot.”

As shown in FIG. 4, the bat can further comprise a reinforcing sleeve 435. The sleeve 435 can comprise a fiber that is suitably strong in tension, yet provides some flexibility. The stretch can enable the bat 100 to flex slightly, for example, without breaking the fibers or causing the bat to be brittle. The sleeve can comprise, for example, and not limitation, fiberglass, Kevlar®, or carbon fiber.

In some embodiments, as shown, the sleeve can comprise fiberglass interwoven at an acute angle. The angular orientation of the strands 440 in direct tension. In this manner, the sleeve 435 can provide reinforcement, yet provide some flex along the longitudinal axis 102 of the bat 100. This configuration can improve the bat 100 durability and restitution because the bat 100 can flex in the direction of travel (i.e., along the axis 102) as the result of impact with the ball. In some embodiments, the strands 440 can be disposed at an angle α of between approximately 15 and 45 degrees to the longitudinal axis 102. In some embodiments, the angle α can be approximately 30 degrees.

As the name implies, conventional bats narrow at the taper 115. In addition, the taper 115 is generally located several inches from the sweet spot 130 on the bat 100, which results in a torque on the bat 100 when hitting. As a result, bats 100 tend to break just above the handle 120 in the taper area 115. This obviously destroys the bat 100, but also presents a danger to infielders and base runners of being injured by flying bat parts.

In embodiments, therefore, the system 100 can further comprise a bat 100 with a reinforcing sleeve 135. The reinforcing sleeve 135 can be placed on the bat such that it partially covers the taper portion 115, the handle portion 110, or both. In this configuration, the sleeve 135 can reinforce the bat 100 where it is most vulnerable (i.e., the portion where the bat narrows 115 and encounters maximum torque). This can prevent the bat 100 from cracking or breaking and can increase the durability and safety of the bat 100.

In some embodiments, the reinforcing sleeve 135 can be located on the bat 100 and then soaked with resin, or other suitable material, to both solidify the sleeve 135 and adhere the sleeve 135 to the bat. In some embodiments, the sleeve 135 can comprise fiberglass bonded to the bat 100 with polyester resin. The sleeve 135 can be painted with resin on the bat, for example, or can be vacuum bagged, or otherwise molded, for improved appearance and reduced material waste. In other embodiments, the sleeve 135 can comprise pre-impregnated carbon fiber (e.g., carbon fiber pre-impregnated with an epoxy resin). The carbon fiber can be placed on the bat 100 and then the assembly can be placed in a vacuum bag, evacuated, and autoclaved.

In some embodiments, the present invention can also comprise a method of manufacturing a bamboo bat with reinforcing sleeve 500. The method 500 can comprise cutting, bamboo, or other suitable material, into multiple strips 505 for assembly into a solid block. In some embodiments, the strips can be cut into squares or rectangles for ease of assembly. Of course, other geometric shapes that enable the strips to be stacked and assembled into a solid are contemplated (e.g., hexagons or triangles). The strips can then be assembled to form a solid block of wood 510 similar to the construction of, for example and not limitation, particle board or plywood.

The block of assembled strips can be shaped to form a bat blank 515. Shaping can be performed, for example and not limitation, using a lathe, CNC machine, or by hand to form a bat blank comprising the aforementioned handle portion, transition portion, and barrel portion. In some embodiments, the shaping can further comprise providing a knob at the end of the handle.

In some embodiments, a reinforcing sleeve can be placed over the bat blank 520. In some embodiments, the reinforcing sleeve can be fiberglass, but other suitable materials such as, for example and not limitation, carbon fiber, cotton, nylon, polyester, and Kevlar® are contemplated. The sleeve can be adhered to the bat 525 using, for example and not limitation, polyester or epoxy resin, glue, varnish, or other adhesives or sealants. In some embodiments, the sleeve can reinforce the bat blank on the upper portion of the handle portion and the lower part of the transition portion. In this manner, the bat blank can be reinforced at the point where it is most likely to break.

In some embodiments, the resin or adhesive can be allowed to cure 530. The resin can be allowed to cure at room temperature (e.g., approximately 25º C.), for example, for approximately 3-4 hours. In some embodiments, the bat blank can be wrapped in cling film (e.g., polypropylene film) and cured further at a higher temperature (e.g., approximately 90º C.). In other embodiments, after application of the sleeve and resin, the bat, or a portion of the bat, can be placed in a vacuum bag. After sealing, the vacuum bag can be evacuated. Placing the bat and wrap under vacuum can enable the removal of excess resin, air bubbles, wrinkles and other anomalies. The bat can then be allowed to cure at room temperature, heated, or autoclaved to complete the curing process. Of course, curing and heating times will be different with different materials and different bat dimensions, among other things.

After curing, the bat blank can be unwrapped, shaped, and/or sanded 535 to the desired smoothness, diameter, and/or weight. In some embodiments, it may be necessary to fill voids or other blemishes with putty and/or perform other finishing work. Once sufficiently smooth, in some embodiments, the bat blank can be painted 540 using a suitable paint (e.g., lacquer, polyeurethane, etc.) to protect the wood and/or sleeve and provide an improved appearance and feel. In some embodiments, stickers, labels, or other items can be affixed thereto.

While several possible embodiments are disclosed above, embodiments of the present invention are not so limited. For instance, while several possible configurations have
been disclosed (e.g., a bamboo bat with fiberglass wrap), other suitable materials and configurations could be selected without departing from the spirit of embodiments of the invention. In addition, the location and configuration used for various features of embodiments of the present invention can be varied according to a particular bat size and weight, a particular set of rules, or simply user preference. Such changes are intended to be embraced within the scope of the invention.

[0045] The specific configurations, choice of materials, and the size and shape of various elements can be varied according to particular design specifications or constraints requiring a device, system, or method constructed according to the principles of the invention. For example, while certain exemplary ranges have been provided for thicknesses and locations, other configurations could be used for different sized bats or bats for different sports. Such changes are intended to be embraced within the scope of the invention. The presently disclosed embodiments, therefore, are considered in all respects to be illustrative and not restrictive. The scope of the invention is indicated by the appended claims, rather than the foregoing description, and all changes that come within the meaning and range of equivalents thereof are intended to be embraced therein.

1. A system comprising:
   a bat blank, having a barrel, a taper, a handle, and a knob, and formed from a plurality of wooden strips glued together to form a unitary blank; and
   a reinforcing sleeve, comprising a plurality of reinforcing fibers disposed at an acute angle to the longitudinal axis of the bat, disposed proximate the taper, the handle, or both, reinforcing the bat.

2. The system of claim 1, wherein the reinforcing sleeve comprises fiberglass adhered to the bat blank with resin.

3. The system of claim 2, wherein the resin comprises polyester resin.

4. The system of claim 2, wherein the resin comprises epoxy resin.

5. The system of claim 1, wherein the reinforcing sleeve comprises pre-impregnated carbon fiber.

6. The system of claim 1, wherein the wooden strips comprise strips of bamboo.

7. The system of claim 1, wherein the acute angle is between 15 degrees and 60 degrees.

8. The system of claim 7, wherein the acute angle is 45 degrees.

9. A method of manufacture comprising:
   applying adhesive to a plurality of wooden strips;
   assembling the wooden strips into a unitary wooden block;
   shaping the unitary wooden block into a rough bat blank comprising a barrel, taper, handle, and knob;
   placing a reinforcing sleeve over the bat blank proximate the taper, the handle, or both;
   adhering the reinforcing sleeve to the bat blank with a resin; and
   curing the resin to harden the reinforcing sleeve;
   wherein the reinforcing sleeve comprises a plurality of reinforcing fibers disposed at an acute angle to the longitudinal axis of the bat.

10. The method of claim 9, further comprising:
   shaping the bat blank with reinforcing sleeve into a final bat blank;
   and
   sanding the surface of the final bat blank to provide a smooth surface.

11. The method of claim 10, further comprising:
   painting the sanded final bat blank.

12. The method of claim 10, further comprising:
   applying decals to the final bat blank.

13. The method of claim 9, wherein shaping the unitary wooden block is performed on a lathe.

14. The method of claim 9, further comprising compressing the plurality of wooden strips after assembly.

15. The method of claim 9, wherein epoxy resin is applied to the plurality of wooden strips prior to assembly.

16. The method of claim 9, wherein the reinforcing sleeve comprises fiberglass.

17. The method of claim 9, wherein the reinforcing sleeve comprises carbon fiber.

18. The method of claim 17, further comprising vacuum bagging the bat blank and reinforcing sleeve prior to curing.

19. The method of claim 9, wherein the acute angle is between 15 degrees and 60 degrees.

20. The method of claim 19, wherein the acute angle is 45 degrees.