Publication Classification

ABSTRACT

A system and method for positively identifying a sports bat to ensure the bat has not been tampered or otherwise altered after manufacture includes an RFID tag that is embedded in the bat during the manufacturing process. The RFID tag stores information related to the individual bat. In competition, the information stored in the embedded RFID tag is read using an RFID reading device. If a bat is modified or otherwise altered after manufacture, the RFID tag will be damaged or missing from the modified bat. In that case, the RFID reading device will be unable to properly read the RFID tag and the information stored on the tag, and the bat may be considered “not approved for play.” In a similar fashion, the RFID tag may also be used to track and maintain inventory control, while ensuring the bat remains in the same condition as when it was manufactured.
BAT WITH AN IDENTIFICATION DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of priority of U.S. Provisional Application Ser. No. 60/708,396, filed on Aug. 16, 2005, entitled “Bat with an Identification Device,” the contents of which are incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to a system and method of positively identifying an item to ensure the item has not been tampered with or otherwise altered. More particularly, it relates to a sports bat that can be used in the game of baseball and/or softball. It is an object of the present invention to provide a bat identification device which satisfies the requirements for a bat identification device used in various sports and offers advantages over prior art. The identification device may be used to track and maintain production, inventory, shipping, and sales control.

BACKGROUND OF THE INVENTION

[0003] With today’s technology and materials available, bat manufacturers are able to produce bats capable of hitting a ball faster than the reaction time of a fielder. As baseball and softball leagues strive to address the increasing number of injuries sustained attributable to high-performance bats, many organizations have mandated performance-regulated bats. The modification of certified performance-regulated bats has become a major problem as even in these amateur leagues, some hitters attempt to gain a competitive advantage by modifying the regulated bats. Many of the certified bats manufactured are easily modified to “out perform” their performance certification. These modifications include changing the weight of a bat, reducing the wall thickness of a bat, and camouflaging non-approved bats. To date, no device has been offered to easily detect counterfeited, altered, or modified bats.

[0004] Bats come in various widths, lengths, and materials. Physics dictates that a heavier bat will give more momentum to the ball: p=mv; where p = momentum imparted, m = mass of the bat, and v = velocity of the bat. However, a heavier bat means less bat speed in the swing. A lighter bat will give the batter more control but less momentum. The restitution of a bat, that is, the relationship with the “bounciness” of an object, also determines how far a ball will travel when struck with a bat. Bats made out of aluminum or graphite or composite materials, including wood composite and polymer composites, hit balls farther than bats made of solid wood.

[0005] Although a stick to hit a ball with is not a difficult concept, a modern bat is a complex object. It is curved or constructed very carefully to allow for a quick balanced swing, while providing power. The bat is divided into several regions. The “barrel” is the thick part of the bat, having a target area of intended contact with a baseball that is often referred to as the “sweet spot.” In physics terminology, this is the “center of percussion” of the bat.

[0006] The end of the barrel is not part of the sweet spot, and is simply called the tip or end of the bat. At the opposite end of the tip of the bat, toward the middle section of the bat, the barrel tapers down, and becomes the “handle.” The handle is very thin, so that batters may comfortably grip the bat in their hands. Sometimes, especially on metal and composite bats, the handle is wrapped with a rubber or cloth “grip.” Finally, at the end of the handle is the “knob” of the bat, a wider piece that keeps the bat from sliding out of a batter’s hands.

[0007] In professional baseball, only wooden bats are permitted, and they are not allowed to be corked—that is, filled with a light substance such as cork or rubber that reduces the weight of the bat without noticeably sacrificing hitting power. In amateur baseball, normally wood, composite, and metal alloy bats are generally permitted, and many professional and amateur leagues dictate that the bats approved for use in the specific league meet specific performance specifications. Some of these specifications are based upon safety concerns, since the lighter composite or metal bats allow greater swing velocity and thereby allow greater distance to be achieved with less batter strength. Bats permitted in one league or in one association’s tournament may not be permitted in a different league or in a different association’s tournament.

[0008] Within the standards set by the various leagues, there is ample latitude for individual variation, and many batters settle on an individual bat profile, or occasionally adopt a profile used by another batter. Formerly, wooden bats were hand-carved to a template obtained from a fixed number of calibration points. Today, bats are machine-turned to a precise metal template. These templates are kept in the bat manufacturers’ vaults. Once the basic bat has been turned, it is then branded with the manufacturer’s name, the serial number, and often the league or association or individual player’s name to whose specifications the bat was manufactured. The head of the bat is then machined or finished. Bats are more often given a rounded head, but bats incorporate a “cup-balanced” head, in which a cup-shaped recess is made in the head. This lightens the bat and moves its center of gravity toward the handle. Finally, the bat is stained or finished in a color approved by the league or association or player for whom it was manufactured. Similarly, composite bats are manufactured in layers on a mandrel, so as the bats are manufactured, they have open ends to remove the mandrel. After the bat has been finished, the ends are sealed with a knob at the handle end and an end plug at the barrel tip.

[0009] In baseball, a corked bat is an illegally modified baseball bat that has been filled with cork or similar light, less dense substances to make the bat lighter without losing much power. A lighter bat gives a hitter a quicker swing (increased velocity) and may improve the hitter’s timing. However, since the bat is lighter, the ball does not necessarily travel quite as far as with a heavier bat, but usually only by a few feet at most. More importantly, in a modified bat the location of the center-of-mass of the bat shifts towards the handle end of the bat. This results in a decreased moment of inertia, and the bat is easier to swing.

[0010] Similarly, with composite or metal or other non-wood bats, hitters may attempt to modify the manufactured bat by sanding or filing the wall of the bat. As mentioned above, once the composite bats are manufactured they have open ends to remove the mandrel. After the bat has been finished, the ends are sealed with a knob and an end plug.
Hitters may modify composite or metal bats by removing the end plug and removing material from the inside of the bat by sanding or filing or by other means. When the end plug is replaced, the illegal modification is extremely difficult to detect. The end effect of altering a composite or metal bat is the same as corking a wooden bat—the center of mass shifts toward the handle end of the bat and the bat now exceeds the performance standards to which it was certified. Some leagues dictate that the wall of the bat be a specified thickness or composition. Similarly, other leagues may specify dimensions and weights for their bats. Other leagues employ a bat performance standards based on collision efficiency, restitution characteristics, or batted ball speed measurements. Leagues enact these rules to attempt to minimize the possibility of injury to and impart uniformity to the equipment used by competing teams, thereby ensuring the higher skilled team prevails in a game rather than the team with the equipment advantage. When hitters modify otherwise approved bats or camouflage non-approved bats to pass them off as approved bats, the hitters acquire an advantage and placed opposing fielders in jeopardy.

[0011] The closer the center-of-mass is to the handle of the bat, the easier it is to swing the bat. For example, the balance points of three 30" wood bats with weights of 26 ounces, 23 ounces, and 20 ounces are located at the same place. Since the profile shapes of the bats are the same and they are all made from the same solid wood, the balance point is the same regardless of the total weight. Similarly with composite or metal bats, the same profile and construction will result in the same balance point regardless of the total weight. In contrast, a corked bat that is actually heavier, but has its balance point more than an inch closer to the handle, will be easier to swing. Likewise, a composite bat that has had the wall of the barrel thinned will also be easier to swing because its balance point is now closer to the handle as well. This is directly related to the swing weight of a bat. This is the reason that not all 28 ounce softball bats swing the same. Similarly, an end-loaded bat can have the same weight as a normal bat, but will feel heavier because more of the mass is distributed towards the barrel end of the bat.

[0012] Less mass, and a lower moment of inertia means faster swing speed. A bat that has less mass, and especially that has a lower moment of inertia, may be swung faster. The reduction in mass of approximately 1.5 ounces may permit a batter to watch the ball travel an additional 5-6 feet from the pitcher before the bat has to commit to a swing. Research has shown that faster bat swing speed results in faster batted-ball speed.

[0013] Less mass, however, also means a less effective collision. Lowering the mass and the moment-of-inertia may increase the bat swing speed, but the lower mass means that the collision between bat and ball is less effective. If the swing speed is kept constant, a heavier bat will always propel the ball faster and farther. So removing mass from the bat will actually reduce the batted-ball speed.

[0014] However, a corked wood bat or a thinner walled composite or metal bat also may impart energy to a pitched ball by a trampoline effect. That is, the bat and ball act as two springs that mutually compress each other, and potential energy in the ball is restored by the spring action of the bat. When a ball hits a solid wood bat, the ball compresses to nearly half its original diameter, losing up to 75% of its initial energy to internal friction forces during this compression. In a hollow bat, or a corked bat, however, the barrel compresses somewhat like a spring when the ball impacts it. This means that the ball is not compressed as much and therefore loses less energy to internal friction forces. Thinner-walled composite or metal bats have more of a trampoline effect than their thicker-walled counterparts. Therefore, the ball loses less energy to frictional forces as well. In both cases, more of the energy temporarily stored in the bat barrel is returned to the ball, and the energy that is lost in the bat compression is a small fraction of what would have been lost in the ball if it had impacted a solid wood bat or a thick-walled composite bat instead.

[0015] With altered bats, there is also an advantage to making contact with a pitched ball. Because the bat is lighter and can be swung faster, a hitter can wait longer before committing to a swing. This means the player can watch the pitched ball travel about 5 or 6 feet further before deciding to swing, thereby resulting in better contact and therefore better performance.

[0016] To modify a wooden bat to a corked bat, a hole approximately 1/2 to 1 inch in diameter is drilled down through the thick end (barrel) of the bat roughly six to eight inches deep. Cork, rubber, sawdust, or other similar material is compacted into the hole and the end is typically patched and repaired with glue and sawdust or a wooden dowel plug. The repaired end is sanded to cover the modification. If the hole were left unfilled, the sound produced by the bat striking a ball is noticeably different. Placing cork beyond roughly six inches into the bat threatens the bat's structural integrity and makes it more susceptible to breakage. Corked bats breaking while in play during games is the most typical way that their use is discovered.

[0017] Similarly, composite and other non-wood bats are often modified by shaving the barrel of the bat to thin the wall of the bat, thereby reducing the weight of the bat and moving the center of mass toward the handle, as described above. Likewise, players may take bats prohibited by their league or association and modify their appearance to pass the bat off as approved for use. Re-finishing, re-painting, and otherwise camouflaging the appearance of non-approved bats is also commonplace.

[0018] In Major League Baseball, and in many minor leagues, baseball and softball associations, and the like, modifying a bat as described above and using it in play is illegal and subject to ejection and further punishment. For example, using an altered or modified bat in Major League Baseball is in violation of Rule 6.06 (d), which reads:

[0019] A batter is out for illegal action when:

[0020] (d) He uses or attempts to use a bat that, in the umpire's judgment, has been altered or tampered with in such a way to improve the distance factor or cause an unusual reaction on the baseball. This includes, bats that are filled, flat surfaced, nailed, hollowed, grooved or covered with a substance such as paraffin, wax, etc. No advancement on the bases will be allowed and any out or outs made during a play shall stand. In addition to being called out, the player shall be ejected from the game and may be subject to additional penalties as determined by his League President.

[0021] To date, no efficient manner of verifying the integrity of a bat has been easily implemented. That is, there has
been no efficient manner of ensuring that the bat to be used by a player meets the performance standards set forth by the league, association, or other governing body for the sport.

SUMMARY OF THE INVENTION

[0022] The present invention relates to a system and method of positively identifying an item to ensure the item has not been tampered with or otherwise altered. In one embodiment, the present invention relates to a sports bat with a radio frequency identification (RFID) tag to facilitate detection as to whether the bat has been tampered with or modified to defeat certified performance standards. An RFID tag is embedded in the bat during the manufacturing process. The RFID tag stores information related to the individual bat, such as manufacturer, model number, serial number, company name, date of manufacture, ship date, length, weight, dimensions, inventory numbers, and the like. The RFID tag may also store information regarding the particular baseball or softball association standards for which the bat is approved.

[0023] The information stored in the embedded RFID tag may be read using an RFID reading device. If a bat is modified or otherwise altered after manufacture, the RFID tag will be damaged or missing from the modified bat. In that case, the RFID reading device will be unable to properly read the RFID tag and the information stored on the tag, and the bat may be considered “not approved for play.”

[0024] In a similar fashion, the RFID tag may also be used to track and maintain production, inventory, shipping, and sales control, by the manufacturer, distributor, retailer, and other components of the supply chain while ensuring the bat remains in the same condition as when it was manufactured.

[0025] In view of these characteristics, an advantage of the present invention is in providing a bat with features to facilitate detection and elimination of a modified or altered bat from competition. This advantage serves to discourage players from modifying or altering the bat and promotes the safety of the competitors. Another advantage of the present invention is in providing a bat that facilitates inventory monitoring and control.

[0026] These and other advantages and features of the present invention will become more apparent from the following detailed description of the preferred embodiments of the present invention when viewed in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] The accompanying drawings illustrate an embodiment of the invention and depict the above-mentioned and other features of this invention and the manner of attaining them. In the drawings:

[0028] FIG. 1 illustrates an exemplary system for storing and reading RFID tag information in a sports bat in accordance with one embodiment of the present invention.

[0029] FIG. 2 shows a partial cross-sectional view of an exemplary bat with an RFID tag embedded within the bat in accordance with one embodiment of the present invention.

[0030] FIG. 3 shows an exemplary radio frequency reading device in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0031] The following detailed description of the invention refers to the accompanying drawings and to certain preferred embodiments, but the detailed description of the invention does not limit the invention. The scope of the invention is defined by the appended claims and equivalents as it will be apparent to those of skill in the art that various features, variations, and modifications can be included or excluded based upon the requirements of a particular use.

[0032] The present invention extends the functionality of sports bats by employing systems and methods of storing and reading manufacturing, inventory, and certification information associated with a particular bat. The stored information is encoded on an RFID (Radio Frequency Identification) tag or similar identification device and embedded within the sports bat. When the sports bat is to be used in a game, the system and method of the invention then reads the stored information on the RFID tag and verifies that the sports bat is approved for use in a particular league or association game, and has not been altered or otherwise modified. If the information read by the RFID reading device is incorrect or nonexistent, the system and method of the present invention returns a message indicating that the bat is not approved for use. The system and method of the present invention has many advantages over prior systems because the determination of a non-approved or modified bat is wholly objective, can be performed prior to the bat being used in a game, and is performed much more quickly than possible solely with manual inspections.

[0033] Likewise, in a production, inventory, shipping, or sales control environment, the information stored on the RFID tag may be read and compared to original manufacturing, supply chain, and inventory control information. If the information read from the RFID tag does not match the original manufacturing information, further investigation may be performed to determine the veracity of a warranty claim, sales receipt information, and other return authorization information that may be used to deter or eliminate fraudulent claims.

[0034] FIG. 1 illustrates an exemplary system in which concepts and methods consistent with the present invention may be performed. As shown in FIG. 1, system 100 comprises a number of radio frequency reading devices 30a, 30b, 30c, 30d placed in locations that may physically receive a bat 10 with an embedded RFID tag 20. For purposes of this disclosure, the terms radio frequency reading device and RFID reading device are synonymous. The radio frequency reading devices 30a, 30b, 30c, 30d may be located anywhere in the world and may be proximate to manufacturing facility 150 or in a location where such bats are distributed, sold, or used. For clarity and brevity, four radio frequency reading devices 30a, 30b, 30c, 30d are shown, but it should be understood that any number of radio frequency reading devices may use the system 100 with which to access sports bat data stored as data in a database. A portion of the database, or the total set of data may be housed within radio frequency reading devices 30a, 30b, 30c, 30d (illustrated in detail in FIG. 3 as database 38) and/or may be maintained in an off-site location. Similarly, updates to data stored within radio frequency reading devices 30a, 30b, 30c, 30d may be updated with data provided by a separate source. For brevity,
FIG. 1 illustrates database 103 as located within the manufacturing facility 152. Database 103 may also be a network of databases as well. Likewise, it should also be understood that any number of manufacturing facilities may be used by the system. For clarity and brevity, a single manufacturing facility 152 comprising an RFID writer 106, an RFID computer 102, an RFID server 104, and a sports bat database 103 is shown as one preferred embodiment. It should also be understood that any radio frequency reading devices 30a, 30b, 30c, 30d may access data housed and stored by another user, such as a second manufacturing facility, a distributor, a reseller, a retail store, or any user that may provide and/or receive data indicative of a sports bat using the RFID tags and database. Manufacturing facility 152 is illustrated as components, including computer 102, database 103, server 104, and tag writer 106 merely to show a preferred embodiment and a preferred configuration. The data collection utilized in database 103 in manufacturing facility 152 can also be in a distributed environment, such as servers and devices on the world wide web.

Radio frequency reading devices 30a, 30b, 30c, 30d may access an data providing node as manufacturing facility 152 through any computer network 198 including the Internet, telecommunications networks in any suitable form, local area networks, wide area networks, wireless communications networks, cellular communications networks, G3-communications networks, Public Switched Telephone Networks (PSTNs), Packet Data Networks (PDNs), intranets, or any combination of these networks or any group of two or more computing devices linked together with the ability to communicate with each other.

As illustrated in FIG. 1, computer network 198 may be the Internet where radio frequency reading devices 30a, 30b, 30c, 30d are nodes on the network as is manufacturing facility 152. Radio frequency reading devices 30a, 30b, 30c, 30d and RFID computer 102a may be any suitable device capable of providing and receiving data to and from another device. For example, these devices may be any suitable servers, workstations, PCs, laptop computers, PDAs, Internet appliances, handheld devices, cellular telephones, wireless devices, other devices, and the like, capable of performing the processes of the exemplary embodiments of FIGS. 1-3. The devices and subsystems of the exemplary embodiments of FIGS. 1-3 can communicate with each other using any suitable protocol and can be implemented using one or more programmed computer systems or devices. In general, these devices may be any type of computing device connected to a network and interacting with application programs.

In manufacturing facility 152, tag writer 106 is used to write data to RFID tag 20. As outlined previously, the various information regarding the bat 10 such as the model number, serial number, manufacturing company name, date of manufacture, ship date, dimensions, and the like may be written to RFID tag 20. RFID tag 20 may also store information regarding for which baseball or softball association standards the bat 10 is approved for use. Of course, additional information may be stored in the RFID tag 20. The particular type of RFID tags selected for use, including write-once, write many, or read only tags, is dependent upon the situation in which the bat will be used. Similarly, more than one RFID tag may be inserted and written to depending upon the information the manufacturer or supply chain participant requires. For example, a single write-once RFID tag may be written with information by the manufacturer. This information would never be subject to change, other than by illegal or unauthorized means. Additionally, as another example, one RFID tag may be written with may be written with performance standard information regarding the bat by the manufacturer; and a second RFID tag may be written by a wholesaler or retailer with inventory information, such as model number, serial number, manufacturing company name, date of manufacture, SKU number, stock number, cost, sales price, and the like. In this manner, the manufacturer has the flexibility to write any or all of the information to one or more RFID tags.

Once the data regarding the bat 10 is written to RFID tag 20 in the manufacturing facility 152, the RFID tag 20 is embedded in bat 10. Bat 10 with RFID tag 20 embedded within it are then shipped to a buyer, such as a retail facility, wholesaler, end user, or the like. Any of these potential buyers may possess a radio frequency reading device 30 with which to read the embedded RFID tag 20.

Ultimately, an end user will acquire a bat 10 and attempt to use it in a game. At that point, RFID tag 20 may be read by radio frequency reading device 30a to access a database. The accessed database 38 may reside within radio frequency reading device 30 (shown in FIG. 3) or the accessed database may reside in a different location than the radio frequency reading device 30a, such as database 103 (as shown in FIG. 1), depending upon the particular unique data and information indicative of the bat being examined and depending upon the desired implementation of this invention. Regardless of the information stored in the embedded RFID tag 20, the information may be read using radio frequency reading device 30, which is schematically shown in FIG. 2 and FIG. 3.

FIG. 2 shows a partial cross-sectional view of an example bat 10 in accordance with one embodiment of the present invention having an RFID tag 20 embedded therein. The bat 10 may be any type of bat that can be manufactured with an RFID tag 20 embedded therein, such as a wood bat, a composite bat, a metal bat, and the like.

As shown in FIG. 2, RFID tag 20 is inserted into the inside layer of the bat 10 while the bat 10 is being manufactured. As detailed above with regard to composite bats, the bats are manufactured in layers on a mandrel with successive layers applied on the mandrel to form a substantially cylindrical bat. The first layer applied becomes the inside-most layer when the manufacturing process is complete. While RFID tag 20 may be inserted into any layer of the bat as the manufacturing process progresses, since most illegal modifications or alterations are performed on the interior of the bat, preferably, the RFID tag 20 is placed approximately between 0.001 to 1 inch in the inner layer of the bat 10. In one embodiment, the RFID tag 20 is embedded in the barrel portion of the bat, because modifications are typically made to the barrel portion of the bat 10. As noted, the RFID tag 20 stores various information regarding the bat 10 such as the model number, serial number, manufacturing company name, date of manufacture, ship date, and the like. The RFID tag 20 may also store information regarding which baseball or softball association standards for which the bat 10 is approved.
Referring also to FIG. 1, when the bat 10 is to be examined, either prior to play in a baseball or softball game situation, or at a retail, wholesale, or other inventory control situation, the bat 10 is brought proximate to radio frequency reading device 30. Radio frequency reading device 30 interrogates RFID tag 20 embedded within bat 10. The RFID tag 20 returns a signal back to the radio frequency reading device 30 with the requested information. Radio frequency reading device 30 is shown in greater detail in FIG. 3 and includes display 32, keypad 34, controller 36, and database 38 such as a memory, disk, or other storage media capable of storing a database.

Once the radio frequency reading device 30 receives the information, the information may be viewed on display 32. Additionally, an on-board controller 36 may be used to process the information by comparing the received information to known information, such as that stored in databases 38 and/or 103. The result of the comparison is then provided to a user on display 32. The results of the comparison may be that the examined bat 10 includes information that exactly matches known information stored in databases 38 and/or 103. The radio frequency reading device 30 may be implemented so that in the case of a baseball or softball game situation, an “approved for play” message or similar message may be shown on display 32. If the bat 10 includes an RFID tag 20 with information that does not match the known information stored in databases 38, 103, or if the RFID tag 20 is missing, or otherwise cannot be interrogated or read by radio frequency reading device 30, a “not approved for play” message or similar message may be shown on display 32. Likewise, the comparison may be performed manually by an umpire or other user capable of distinguishing between bats approved for play and those not permitted on the basis of the displayed information. For example, when the display 32 reads “2006 Worth Mayhem 120 Slowpitch Softball Bat,” an umpire may know that this bat is approved for use in all USSSA (United States Specialty Sports Association) and NSA (National Softball Association) tournaments and that the bat is therefore “approved for play.”

Similarly, in the case of production, inventory, shipping, sales control, merchandise tracking, and order management, the information queried by the radio frequency reading device 30 may relate to stock numbers, SKU information, cost and warranty information, and the like. In these situations, the message shown on display 32 may relate to start or end of warranty periods, authorized dealers, restocking charges, and the like. The message displayed by radio frequency reading device 30 may be customized or configured by the user, be they a shipping coordinator, a customer service representative, or an umpire, for example.

For example, if a particular bat is sold by Anaconda Sports®, Anaconda Sports® may store data related to that bat on the RFID tag. If a purchaser or other user attempts to make a warranty return outside the stipulated warranty period, the RFID tag will provide information to ensure the accuracy of the warranty claim. Additionally, if a purchaser were to attempt to return the bat to a different manufacturer or supplier, the RFID tag will provide information related to the identity of the manufacturer, the identity of the seller, the model number, and additional information with which to confirm an authorized return.

Additionally, by practicing the method of the present invention, an end user may provide important feedback to a manufacturer or other seller regarding the bat. For example, an association that monitors bats that are used in their league tournament monitors 100 bats by reading the RFID tag in each of the 100 bats with a radio frequency reading device. The league or association may determine that each of a particular manufacturer’s bats examined are out-of-compliance with league specifications and rules and are thereby considered “not approved for play.” The league or association may upload the data acquired when reading the RFID tag of each of the particular manufacturer’s bats and send the data to the manufacturer. With this information, the manufacturer may address quality control, shipping, warranty, and other issues related to the bats.

One exemplary embodiment of the radio frequency reading device 30 has the capability to query and read an RFID tag from the bat 10, view data from RFID tags, write RFID tag data, clear RFID tag data, and view comparison data for RFID tags, as applicable. Multiple radio frequency reading devices 30 may be connected on a single network. One embodiment of the present invention uses a Datalogic JET mobile computing device configured as a radio frequency reading device. The Datalogic reading device captures, computes, and communicates RFID tag information using Microsoft Windows CE 4.2 Net Operating System. This example implementation includes an Intel XScale 400 MHz microprocessor with 64 MByte system RAM and 32/64 MByte system flash memory and employs a real-time clock for time and date stamping under software control. Additionally, the reading device of this example includes IrDA integrated high speed bi-directional communication port (IrDA 1.0); an integrate 3 pin RS232 serial communication port up to 115.2 Kbps, and a USB integrated high speed port (USB 1.1). This example implementation of the reading device also includes wireless data communication on a local area network using IEEE 802.11b (Wi-Fi), an internal antenna with diversity option, and a frequency range of typically 2.4-2.5 GHz. Wide area wireless network data communication may include GSM/GPRS (900/1800/1900 MHz) user accessible SIM socket for FSG/GPRS, an internal antenna, and Bluetooth IEEE 802.15.

The Datalogic radio frequency reading device operates at 13.56 MHz for RFID applications and has the capability of reading an RFID tag within 10 cm. Of course, the radio frequency reading device may be any similar reading device capable of reading one or more of the EMS LPR Series, ISO 15693, Gemplus FOLIO, Inside Picotag, Omron V720, Philips I.CODE, Microchip MCRI355, MCRF360, Texas Instruments RFID Tag-it, or other similar RFID tags.

An alphanumeric keypad 34 and a display screen 32 facilitate input/output communication from and to a user. The portable reader is built for indoor and outdoor use and is preferably rain and dust resistant, IP64 compliant, powered by rechargeable lithium ion 7.4 volt 1070/1800 mAh (7.9/13.3 Watt-hours) battery with a connection for fast battery charging. There are integrated radio options and integrated scanner options for the reading device as well. Preferably, the reading device 30 may be accommodated by a docking station (not shown) to provide desktop or workstation connectivity. This allows the RFID tag data stored in the radio frequency reading device to be uploaded to other
users such as the manufacturing facility, distributor, and other similar users that may have a need for such data.

As described, the radio frequency reading device 30 reads the data to ensure the bat 10 has not been modified or is otherwise not approved for use. The embedded RFID tag 20 in bat 10 may be used for determining and discouraging user modifications to certified bat performance standards. In particular, when modifying bats, users typically remove material from the inner layer of the bat 10. Because the RFID tag 20 is embedded between 0.001 to 0.005 inch from inner layer of the bat 10, removal of material will damage or remove the RFID tag 20. In other words, damage of the RFID tag 20 renders it inoperable. If the RFID tag 20 cannot be read using the radio frequency reading device 30, whether because the RFID tag 20 is damaged or is missing, the bat 10 may be considered to be damaged or tampered with, and "not approved for play".

Attempts to disguise the bat 10 by painting it to appear as a different model which is legal for play in a particular league may be detected and prevented by reading the information stored in the RFID tag 20, which preferably includes the manufacture model numbers. Therefore, the present invention also makes the use of a mis-marked bat more difficult and discourages such attempts.

The present invention also allows improved production, inventory, shipping, and sales tracking and management of returns to reduce false returns to the manufacturers. In this regard, unique numbers, such as serial numbers assigned to each bat, can be stored in the RFID tag 20. Such numbers can be used for inventory control purposes and to check bats for return authorization. In addition, as described, the manufacture can read the RFID tag 20 to detect fraud when warranty issues arise. In this regard, it is not unusual for people to buy false receipts for fraudulent claims through the Internet. Correspondingly, the present invention helps to discourage such practices.

The devices and subsystems of the exemplary embodiments of FIGS. 1-3 are for exemplary purposes, as many variations of the specific hardware used to implement the exemplary embodiments are possible, as will be appreciated by those skilled in the relevant arts. For example, the functionality of one or more of the devices and subsystems of the exemplary embodiments of FIGS. 1-3 can be implemented via one or more programmed computer systems, devices, or methods. The devices and subsystems of the exemplary embodiments of FIGS. 1-3 can store information relating to various processes described herein. This information can be stored in one or more memories, such as a hard disk, optical disk, magneto-optical disk, RAM, and the like, of the devices and subsystems of the exemplary embodiments of FIGS. 1-3. One or more databases of the devices and subsystems of the exemplary embodiments of FIGS. 1-3 can store the information used to implement the exemplary embodiments of the present invention.

All or a portion of the devices and subsystems of the exemplary embodiments of FIGS. 1-3 can be conveniently implemented using one or more general purpose computer systems, microprocessors, digital signal processors, micro-controllers, and the like, programmed according to the teachings of the exemplary embodiments of the present invention, as will be appreciated by those skilled in the computer and software arts. Additionally, network transmission media can include coaxial cables, copper wire, fiber optics, and the like. Network transmission media also can take the form of acoustic, optical, electromagnetic waves, and the like, such as those generated during radio frequency (RF) communications, infrared (IR) data communications, and the like.

The foregoing description of exemplary aspects and embodiments of the present invention provides illustration and description, but is not intended to be exhaustive or to limit the invention to the precise form disclosed. Those of skill in the art will recognize certain modifications, permutations, additions, and combinations of those embodiments are possible in light of the above teachings or may be acquired from practice of the invention. Therefore, the present invention also covers various modifications and equivalent arrangements that would fall within the purview of appended claims and claims hereafter introduced.

The claimed invention is:

1. A sports bat identification system comprising:
   a sports bat;
   an RFID tag embedded in the sports bat, the RFID tag storing the data indicative of the sports bat;
   an RFID reading device with a display, the RFID reading device adapted to read the data indicative of the sports bat stored in the RFID tag embedded in the sports bat and to display the read data.

2. The sports bat identification system of claim 1, further comprising a sports bat database adapted to store data indicative of the sports bat.

3. The sports bat identification system of claim 2, wherein the RFID reading device is further adapted to compare the data indicative of the sports bat read by the RFID reading device to the data stored in the sports bat database to determine if a match exists and to display a message indicating the results of the comparison.

4. The sports bat identification system of claim 3, wherein the RFID reading device is further adapted to display a message indicating that the sports bat is not approved for play if the RFID data indicative of the sports bat read by the RFID reading device does not match the RFID data stored in the sports bat database.

5. The sports bat identification system of claim 3, wherein the RFID reading device is further adapted to display a message indicating that the sports bat is not approved for play if no RFID data indicative of the sports bat is read by the RFID reading device.

6. The sports bat identification system of claim 3, wherein the RFID reading device is further adapted to display a message indicating that the sports bat is approved for play if the RFID data indicative of the sports bat read by the RFID reading device matches the RFID data stored in the sports bat database.

7. The sports bat identification system of claim 3, wherein the RFID reading device is further adapted to display a message indicating that the sports bat is not approved for warranty consideration if the RFID data indicative of the sports bat read by the RFID reading device does not match the RFID data stored in the sports bat database or if no RFID data indicative of the sports bat is read by the RFID reading device.

8. The sports bat identification system of claim 3, wherein the RFID reading device is further adapted to display a
message indicating that the sports bat is approved for warranty consideration if the RFID data indicative of the sports bat read by the RFID reading device matches the RFID data stored in the sports bat database.

9. The sports bat identification system of claim 1, further comprising an RFID tag writer adapted to write the RFID data indicative of the sports bat to the RFID tag.

10. The sports bat identification system of claim 1, wherein the sports bat comprises a composite material.

11. The sports bat identification system of claim 10, wherein the composite material includes a polymer.

12. The sports bat identification system of claim 10, wherein the composite material includes a resin matrix encapsulating reinforcement fibers.

13. The sports bat identification system of claim 1, wherein the sports bat comprises a metallic material.

14. A sports bat comprising:

- a cylindrical barrel portion including a target area of intended contact with a ball;
- a handle portion of a smaller cross-sectional dimension than the barrel portion of the sports bat;
- a tapered middle portion connecting the cylindrical barrel portion and the handle portion;
- a knob portion located at the end of the handle portion opposite the tapered middle portion, the knob portion having a larger cross-sectional dimension than the handle portion of the sports bat; and
- an RFID tag embedded within the sports bat.

15. The sports bat of claim 14, wherein the embedded RFID tag is embedded within the barrel portion of the sports bat.

16. The sports bat of claim 14, wherein the embedded RFID tag stores data indicative of the sports bat, the data readable by an RFID reading device.

17. The sports bat identification system of claim 14, wherein the sports bat comprises a composite material.

18. The sports bat identification system of claim 17, wherein the composite material is a polymer.

19. The sports bat identification system of claim 17, wherein the composite material comprises a resin matrix encapsulating reinforcement fibers.

20. The sports bat identification system of claim 14, wherein the sports bat comprises a metallic material.

21. A method for identifying a sports bat comprising:

- storing data indicative of the sports bat in a sports bat database;
- writing the data indicative of the sports bat from the sports bat database to an RFID tag; and
- embedding the RFID tag in the sports bat.

22. The method for identifying a sports bat of claim 21, wherein the stored data includes sports associations for which the bat is approved for play.

23. The method for identifying a sports bat of claim 21, wherein the stored data includes at least one of model number, serial number, manufacturing company name, date of manufacture, SKU number, stock number, cost, sales price, and ship date.

24. The method for identifying a sports bat of claim 21, further comprising reading the data indicative of the sports bat stored in the RFID tag embedded in the sports bat with an RFID reading device.

25. The method for identifying a sports bat of claim 24, further comprising comparing the data indicative of the sports bat read by the RFID reading device to data stored in a sports bat database to determine if a match exists.

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