A method of applying an image to bowling balls. The method includes printing the image onto a transfer sheet with sublimation inks. The printed transfer sheet is placed to envelope an outer surface layer formed of polyester or urethane of a bowling ball. Heat and pressure is applied uniformly to the transfer sheet to cause the sublimation inks to diffuse into the polyester or urethane surface layer of the bowling ball. A high quality durable image is thus applied to the bowling ball without affecting the performance or altering surface of the bowling ball.
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DECORATIVE BOWLING BALL AND METHOD THEREFOR

FIELD OF THE INVENTION

[0001] This invention relates to the field of bowling balls and particularly to the field of making decorative bowling balls.

BACKGROUND OF THE INVENTION

[0002] The sport of bowling has evolved over the centuries into its present form of ten-pin or lane bowling. In this game, a bowling ball having fixed finger holes is rolled down a lane towards ten pins arranged in a triangular pattern. The player knocking down the most pins over a series of frames wins the game.

[0003] The size and shape of the ten-pin bowling ball commonly used in the United States and other countries is relatively standard, particularly in competitive bowling. These balls come in different colors and finishes and occasionally will have engraving or decals applied to them. Beyond that, there is little to distinguish the balls or to provide individuality to different balls.

[0004] Various techniques have been attempted in the past to provide a unique and individual appearance to bowling balls. For instance, decals have been applied. There have been attempts at silk screening images directly onto the bowling balls.

[0005] These attempts have not been successful in the past due to the shape, surface and use of the bowling balls. The surface finish of bowling balls is critical to the use of the balls. The interaction of the bowling lane, the surface finish of the bowling ball and the technique of the bowler allow the bowler to "hook" or curve the ball as it travels down the bowling lane to provide a desired trajectory for the ball to strike the pins. The trajectory of the ball in striking the pins influences the number of the pins struck and of the pins striking other pins. Thus, the use of external printing, decals, coatings or other applications on the surface of the bowling ball will affect the performance of the ball. Also, these external applications are not particularly durable due to the aggressive pounding, striking and frictional resistance between the balls, lanes and pins. Further, the balls are frequently cleaned. These harsh cleaners have also removed the prior art images and decals from the bowling balls.

[0006] Most bowling balls range being formed from hard rubber compounds that were popular from the turn of the century until about 1960 to resin compounds that are popular at present. Bowling balls manufactured at present are either made of a uniform density resin compound throughout or have a rubber or resin cover material encapsulating a conventional inner core. Some bowling balls may even include a weight in the center of the bowling ball to improve its hooking characteristics.

[0007] There have been previous attempts to apply images to other products, but none successfully to bowling balls. For example, U.S. Pat. No. 5,851,331 discloses a method for applying images through sublimation to skis, surfboards, snowboards, skateboards and the like. That process requires applying a transparent layer to the object and then applying a varnish layer over the applied image. This would not be suitable to bowling balls as the additional layers would disrupt the performance of the bowling ball.

[0008] A technique for applying an image to a golf putter is disclosed in U.S. Pat. No. 6,024,650. This technique includes applying an additional layer on which the image is to be applied at a non-striking portion of the putter. This also would disrupt the performance of bowling balls.

[0009] There have been other applications for applying images through sublimation to specific objects. For example, U.S. Pat. No. 6,035,777, discloses a process of transferring a sublimation ink image to a Flower Pot; U.S. Pat. No. 5,944,931 discloses a method and apparatus for printing a sublimation transfer onto mugs with handles; U.S. Pat. No. 5,832,819 discloses a method for transferring an image onto an object having curved surfaces; and U.S. Pat. No. 6,004,900 discloses a composite article for sublimation-printing and method of manufacture. None of these applications are suitable for use with bowling balls without affecting their performance.

[0010] Thus, there is presently a need for a method to apply unique images to the surface of a bowling ball in such a manner that is durable and will not affect the performance of the bowling ball.

SUMMARY OF THE INVENTION

[0011] The present invention provides a solution to these needs and others. In a preferred embodiment of the present invention, a method for applying images directly onto the outer surface of bowling balls has been developed. The method of the present invention includes applying an image through sublimation onto an outer surface layer formed of a cross-linked plastic material, such as polyester or certain urethane materials. This outer surface is receptive of the diffused sublimation dyes when heat and pressure is applied to an image on a transfer sheet.

[0012] The sublimation process, as is well known, occurs through the phase changes of dispersed dyes diffusing into the surface layer. Prior products onto which sublimation has been used typically require porous layers, such as textiles or require a coating to be applied on which the image is applied. Another varnish or coating is then applied to preserve the image.

[0013] The present invention solves these problems by using a polyester outer surface layer on the bowling ball itself that has sufficient hardness required for bowling. Alternatively, urethane or other materials can be used for this outer layer. These materials include cross-linking properties to increase the durability of the sublimated image.

[0014] The image can include virtually any graphic, photograph, logo, text, color, pattern or any other image desired. The selected image can be processed for color, size, shape, pattern, etc. and converted into printer signals, silk screened or by other printing techniques. The image is then printed with sublimation inks onto a transfer sheet. Preferably, the transfer sheet is flexible so to surround the bowling ball.

[0015] Heat and pressure is then applied to the transfer sheet around the bowling ball. Several techniques are available for applying the heat and pressure to the bowling ball and transfer sheet, such as a heat-press having a cavity in the
shape of the bowling ball, or by applying a vacuum to flexible membranes surrounding the bowling ball, and by other techniques.

[0016] The image is transferred by heat and pressure to the bowling ball by the dispersed dyes of the sublimation inks diffusing into the polyester or urethane outer layer of the bowling ball. This applied image is high quality and durable and will not affect the performance of the bowling ball.

[0017] These and other features will be evident from the drawings and the detailed description of preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] FIG. 1 is a view of a typical bowling ball having an image applied thereto in accordance with a preferred embodiment of the present invention.

[0019] FIG. 2 is a cutaway view of the bowling ball of FIG. 1.

[0020] FIG. 3 is a view of a flexible membrane heat press of a preferred embodiment of the present invention.

[0021] FIG. 4 is a view of a heat press of a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[0022] The present invention provides a method and systems for applying images to the surface of a bowling ball. In the preferred embodiment, the present invention is able to do so in a manner that provides a long-lasting durable image without affecting the performance of the bowling ball.

[0023] The method of applying an image to the surface of a bowling ball, in a preferred embodiment of the present invention, is illustrated in FIGS. 1-4. It is to be expressly understood that this description of a preferred embodiment is provided for explanatory purposes only and is not meant to limit the scope of the claimed inventions. Other embodiments are considered to be within the inventive scope of as set forth in the claims.

[0024] Bowling ball 10, shown in FIGS. 1 and 2, includes an inner core 12 formed of a material such as graphite, urethane, rubber or other materials conventionally used in forming bowling balls. In some models, not shown, the inner core 12 may also include a weight member as well. Bowling ball 10 also includes an outer shell or “coverstock” 14. The coverstock 14, in the preferred embodiment, has a thickness between a few millimeters to several centimeters. Coverstock 14 is, in the preferred embodiment, formed of polyester resin. The polyester material used in forming the coverstock 14 includes the property of having a minimum ball surface hardness of 72 Shore D durometer, in accordance of the regulations of the American Bowling Congress specifications. It is to be expressly understood that other hardresses can be used as well, such as for recreational bowlers. Alternatively, the entire ball could be formed as a single structure of polyester material. Coverstock 14 may also be formed of certain urethane materials that have cross-linking properties and the minimum ball surface hardness as well. Bowling ball 10 may be of any color resin as conventionally available. In the preferred embodiment, bowling ball 10 is preferably opaque, white or transparent colors to enhance the applied image.

[0025] Bowling ball 10 also includes finger holes 16. Typically, regulation bowling balls have a circumference ranging from 26.70 to 27.02 inches, as regulated by the American Bowling Congress specifications. Other sizes may also be used under the scope of the present inventions as well.

[0026] A digital, silk screen or other type of printed image is prepared for applying onto such bowling balls. In the preferred embodiment, the image may be scanned with a conventional scanner, it may be prepared from a digital graphics package, it may be available from a digital image library, downloaded from the Internet, taken with a digital camera or from any other digital source. It is to be expressly understood that other types of printing, such as silk-screening, offset printing, etc., can be used as well to create the printed image on the transfer sheet.

[0027] The digital image can be of any image. For example, a name or nickname could be used, a team or company logo, photographs of any person or any other image that may be desired can be used. Additionally, most combination of colors may be used as well. The image may also be a graphic pattern, solid color or combination of graphic patterns and colors. The only limitation is that of the size of the ball on which the image is to be applied.

[0028] Once the digital image has been obtained, it may be necessary to “process” the image. This processing would simply be to ensure that the image that is to be applied is the desired size and shape, that any defects in the image is corrected and that the colors of the image are matched between the devices, such as the image source device, the printer (discussed below) and other devices, such as a monitor. This process can be done automatically, or in another preferred embodiment, skipped altogether. The digital image is then converted to printer control signals either at the processor or at the printer.

[0029] The digital image is then sent electronically to a printer. The printer uses sublimation inks, such as solid dyes, semi-solid dyes, waxes, ink-jet, toners or other sublimation printing techniques such as silk screen, electrostatic, offset or rotogravure printing. In the preferred embodiment, the sublimation inks use dispersed dyes, such as azo dyes, nitroaryl-lamine dyes and anthraquinone dyes. Other types of inks and dyes may be used as well that enable sublimation or heat-activated application of images. The sublimation inks used in this process are commercially available from numerous sources. The preferred embodiment includes commercially available sublimation printers, such as ink-jet printers, thermal transfer printers, wax-based printers, solid ink printers, laser printers, electrostatic printers, offset printers, silk-screen printers and other such printers for use in sublimation printing.

[0030] The printer prints the image onto a transfer sheet with the sublimation inks. The transfer sheet can be plain paper, textiles, polyvinyl, polyester or other plastic materials, depending on the application process used. Again, these transfer sheets are commercially available.

[0031] In the preferred embodiment, the printed transfer sheet is then placed on the outer surface 20 of the bowling ball under pressure. Heat is then applied to the printed
transfer sheet as well. For example, temperature in the range of 220 degrees F. to 400 degrees F. might be applied for about thirty seconds up to 30 minutes. The temperature, pressure and time ranges are dependent upon the type of sublimation ink used in the process, the material of the outer surface layer of the bowling ball, and other interdependent factors.

[0032] The heat and pressure applied to the transfer sheet causes the sublimation inks to diffuse through phase change of the ink into a vapor or gas form. The dispersed dyes of the ink diffuses into the polyester outer surface of the bowling ball a depth of several microns beneath the outer surface. The attachment of the diffused dyes of the ink to the cross-linking properties of the polyester or urethane material of the coverstock 14 of the bowling enhance the durability of the applied image.

[0033] In the preferred embodiment of the present invention, the transfer sheet may be applied to a portion of the bowling ball 10, or to the entire ball. It is preferred that the transfer sheet be applied uniformly against the bowling ball to eliminate wrinkles and folds that might cause imperfections in the image or on the outer surface of the ball. There are several techniques available to do this.

[0034] One technique is disclosed in U.S. Pat. No. 5,308,426, issued to Claveau and incorporated herein by reference. This technique involves using a air-permeable flexible material as the transfer sheet. This transfer sheet envelopes the object onto which the image is to be applied. A vacuum is introduced to draw the transfer sheet against the object and heat is then applied.

[0035] Another alternative technique is disclosed in U.S. Pat. Nos. 5,798,017 and 5,893,964, issued to Claveau, and U.S. Pat. No. 4,670,084, issued to Durand, all of which are incorporated herein by reference. This technique is similar to the above technique but uses a flexible membrane to use a flexible membrane placed under a vacuum to apply pressure against the transfer sheet.

[0036] In this preferred embodiment as shown in FIG. 3, the system includes a bed having a surface shaped to receive a bowling ball. The transfer sheet bearing the printed image is placed around the bowling ball. The transfer sheet, which as discussed above, is preferably a flexible, stretchable sheet. A flexible membrane 300 is then placed around the transfer sheet and the bowling ball. In the preferred embodiment, the surface of the bed for receiving the bowling ball may be formed of a flexible membrane as well. Alternatively, the bed is formed separately from the membrane.

[0037] A vacuum 310 is applied to draw the membrane into pressurized engagement with the transfer sheet and the bowling ball and the bed. The membrane and/or bed are then heated to cause the dyes to sublimate into the outer surface of the bowling ball. This heating can be done by radiant heating units around the membrane and/or bed or by placing the bed into an oven unit.

[0038] An alternative preferred embodiment is to use a shrink-wrap material as the transfer sheet or to envelope the transfer sheet with a shrink-wrap material. As heat is applied to this material, the material shrinks to apply pressure to the image. A similar technique is discussed in U.S. Pat. No. 5,962,368, issued to Poole and incorporated herein by reference.

[0039] Another alternative preferred embodiment, shown in FIG. 4, is to use a heat press 400 having a cavity 410, 412 formed in the shape of the bowling ball. The cavity may include resilient heat transmitting pads to compensate for differing sizes of balls. The transfer sheet is placed around the bowling ball. The transfer sheet and bowling ball is then placed in the cavity. The heat press having a mating cavity is placed over the exposed portion of the bowling ball and transfer sheet. The appropriate heat and pressure is then applied to the bowling ball to transfer the image through sublimation.

[0040] It is to be expressly understood that other embodiments are within the scope of the claimed inventions. Other techniques for applying the transfer image uniformly around a bowling ball, such as by adhesives are within the claimed inventions. Other techniques for applying pressure and heat uniformly around the transfer sheet and the bowling ball are also within the claimed inventions.

What is claimed is:

1. A method for applying a durable image to the outer surface of a bowling ball, said method comprising the steps of:
   - applying ink capable of sublimation in the form of an image to a transfer sheet;
   - providing a bowling ball having an outer surface formed of material having cross-linking resins and a surface hardness sufficient to meet the demands of bowling;
   - placing said transfer sheet against the outer surface of the bowling ball;
   - applying uniform pressure against said transfer sheet; and
   - applying heat to said transfer sheet so that said ink sublimates into the outer surface of said bowling ball.

2. The method of claim 1 wherein said step of placing said transfer sheet against the outer surface of a bowling ball includes:
   - placing said transfer sheet around the entire bowling ball.

3. The method of claim 1 wherein said step of providing a bowling ball includes:
   - providing a bowling ball having an outer surface layer formed of polyester.

4. The method of claim 1 wherein said step of providing a bowling ball includes:
   - providing a bowling ball having an outer surface layer formed of urethane.

5. The method of claim 1 wherein said step of applying uniform pressure against said transfer sheet includes:
   - placing the bowling ball and transfer sheet into a flexible membrane; and
   - applying a vacuum to the flexible membrane to create uniform pressure around the bowling ball and transfer sheet.

6. The method of claim 1 wherein said step of applying uniform pressure against said transfer sheet includes:
   - placing a shrink-wrap element around the bowling ball and transfer sheet; and
applying heat to said shrink-wrap element to create uniform pressure around the bowling ball and transfer sheet.

7. The method of claim 1 wherein said step of applying uniform pressure against said transfer sheet includes:

providing a heat press system having a cavity for holding the bowling ball and transfer sheet.

8. The method of claim 1 wherein said step of applying heat against said transfer sheet includes:

providing a heat press system having a cavity for holding the bowling ball and transfer sheet.

9. A bowling ball having decorative graphics, said bowling ball comprising:

an outer surface layer formed of a material having cross-linking resins and a surface hardness adequate for the needs of bowling; and

an image printed with sublimation inks applied to said outer surface layer under heat and pressure.

10. The bowling ball of claim 9 wherein said outer surface layer includes:

a polyester material.

11. The bowling ball of claim 9 wherein said outer surface layer includes:

a urethane material.

12. The bowling ball of claim 9 wherein said bowling ball includes:

said image printed with sublimation inks is applied to said bowling ball by printing said image onto a transfer sheet;

placing said bowling ball and said transfer sheet into a flexible membrane;

applying a vacuum to said flexible membrane to create uniform pressure around said bowling ball and said transfer sheet; and

applying heat to said transfer sheet to cause said image to be applied to said outer surface by sublimation of said sublimation inks into said outer surface.

13. The bowling ball of claim 9 wherein said bowling ball includes:

said image printed with sublimation inks is applied to said bowling ball by printing said image onto a transfer sheet;

placing a shrink-wrap element around said bowling ball and said transfer sheet;

applying heat to said shrink-wrap element to create uniform pressure around said bowling ball and said transfer sheet; and

applying heat to said transfer sheet to cause said image to be applied to said outer surface by sublimation of said sublimation inks into said outer surface.

14. The bowling ball of claim 9 wherein said bowling ball includes:

said image printed with sublimation inks is applied to said bowling ball by printing said image onto a transfer sheet;

providing a heat press system having a cavity for holding said bowling ball and said transfer sheet; and

applying heat and pressure to said transfer sheet to cause said image to be applied to said outer surface by sublimation of said sublimation inks into said outer surface.

15. A system for applying images to bowling balls having an outer surface layer formed of a material having cross-linking resins and a surface hardness adequate to withstand bowling, said system comprising:

means for printing an image onto a transfer sheet with sublimation inks; and

means for applying uniform pressure and heat to said printed transfer sheet against the outer surface layer of a bowling ball to transfer the printed image from said printed transfer sheet to the outer surface layer by sublimation of the sublimation inks from said printed transfer sheet into the outer surface layer of the bowling ball.

16. The system of claim 15 wherein said means for applying uniform pressure and heat to said printed transfer sheet against the outer surface layer of a bowling ball to transfer the printed image from said printed transfer sheet to the outer surface layer by sublimation of the sublimation inks from said printed transfer sheet into the outer surface layer of the bowling ball includes:

a flexible membrane for holding a bowling ball and said printed transfer sheet;

means for applying a vacuum to the flexible membrane to create uniform pressure around the bowling ball and said transfer sheet; and

means for applying heat to said transfer sheet to transfer the printed image from said printed transfer sheet to the outer surface layer of the bowling ball.

17. The system of claim 15 wherein said means for applying uniform pressure and heat to said printed transfer sheet against the outer surface layer of a bowling ball to transfer the printed image from said printed transfer sheet to the outer surface layer by sublimation of the sublimation inks from said printed transfer sheet into the outer surface layer of the bowling ball includes:

a shrink wrap element for wrapping around a bowling ball and said printed transfer sheet;

means for applying heat to said shrink wrap element to create uniform pressure around the bowling ball and said transfer sheet; and

means for applying heat to said transfer sheet to transfer the printed image from said printed transfer sheet to the outer surface layer of the bowling ball.

18. The system of claim 15 wherein said means for applying uniform pressure and heat to said printed transfer sheet against the outer surface layer of a bowling ball to transfer the printed image from said printed transfer sheet to the outer surface layer by sublimation of the sublimation
inks from said printed transfer sheet into the outer surface layer of the bowling ball includes:

a heat press having a cavity for holding a bowling ball and said printed transfer sheet;

means on said heat press for applying a uniform pressure around the bowling ball and said transfer sheet; and

means on said heat press for applying heat to said transfer sheet to transfer the printed image from said printed transfer sheet to the outer surface layer of the bowling ball.

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