US 20060060625A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2006/0060625 A1**

Kuder et al. (43) **Pub. Date: Mar. 23, 2006**

(54) **CUSTOM MOLDED BACKPACK HIPBELT AND METHOD**

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(21) Appl. No.: **11/168,146**

(22) Filed: **Jun. 27, 2005**

Related U.S. Application Data

(60) Provisional application No. 60/583,011, filed on Jun. 25, 2004.

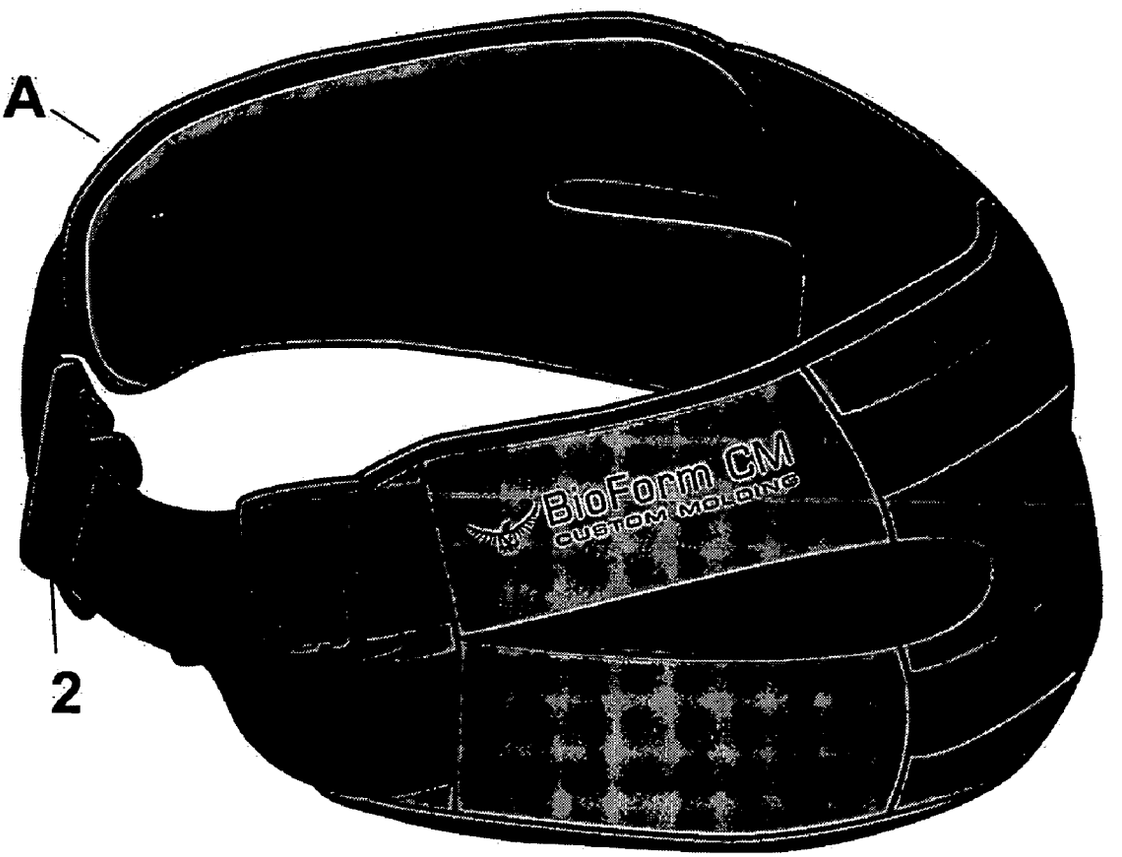
Publication Classification

(51) **Int. Cl.**
A45F 3/04 (2006.01)

(52) **U.S. Cl.** **224/637**

(57) **ABSTRACT**

A custom molded hipbelt for a backpack and method for molding it to a user comprising the steps of **(1)** providing a belt blank assembly of a thermo-moldable foam material within a sewn or laminated shell, **(2)** heating the foam portion of the blank sufficiently to allow molding of the foam while preventing the heating of non-moldable hardware, **(3)** positioning the blank on the hips of a user as it would be worn in use and **(4)** simulating a load, while allowing the foam material to cool and set in a form custom molded to the user.



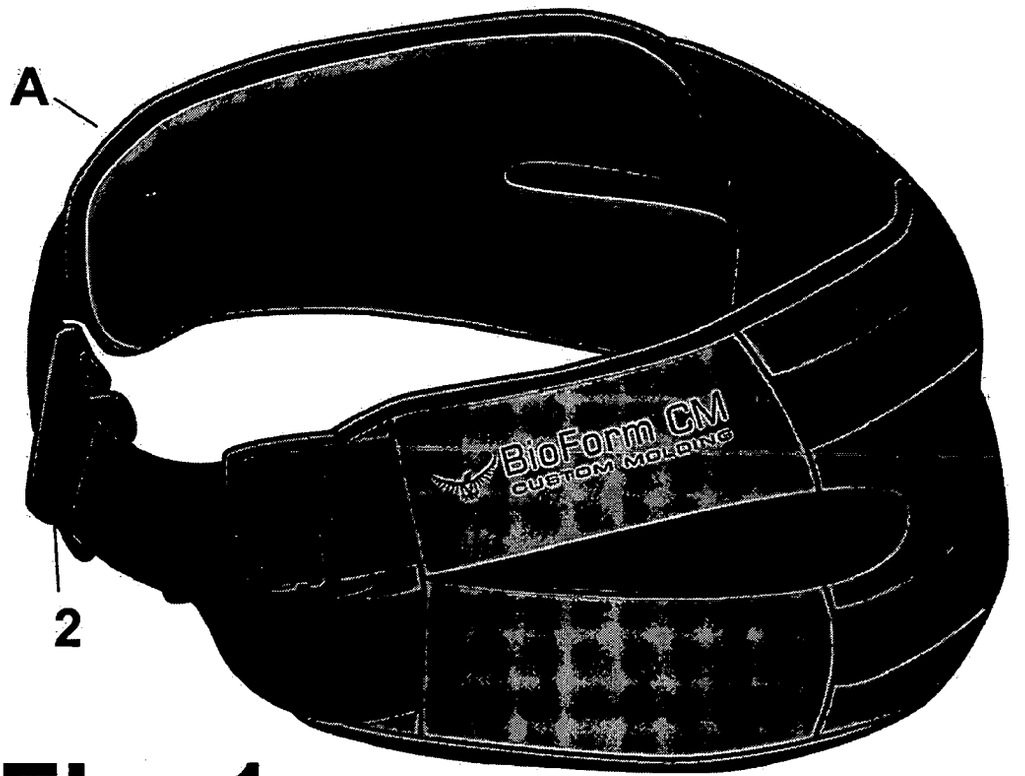


Fig. 1

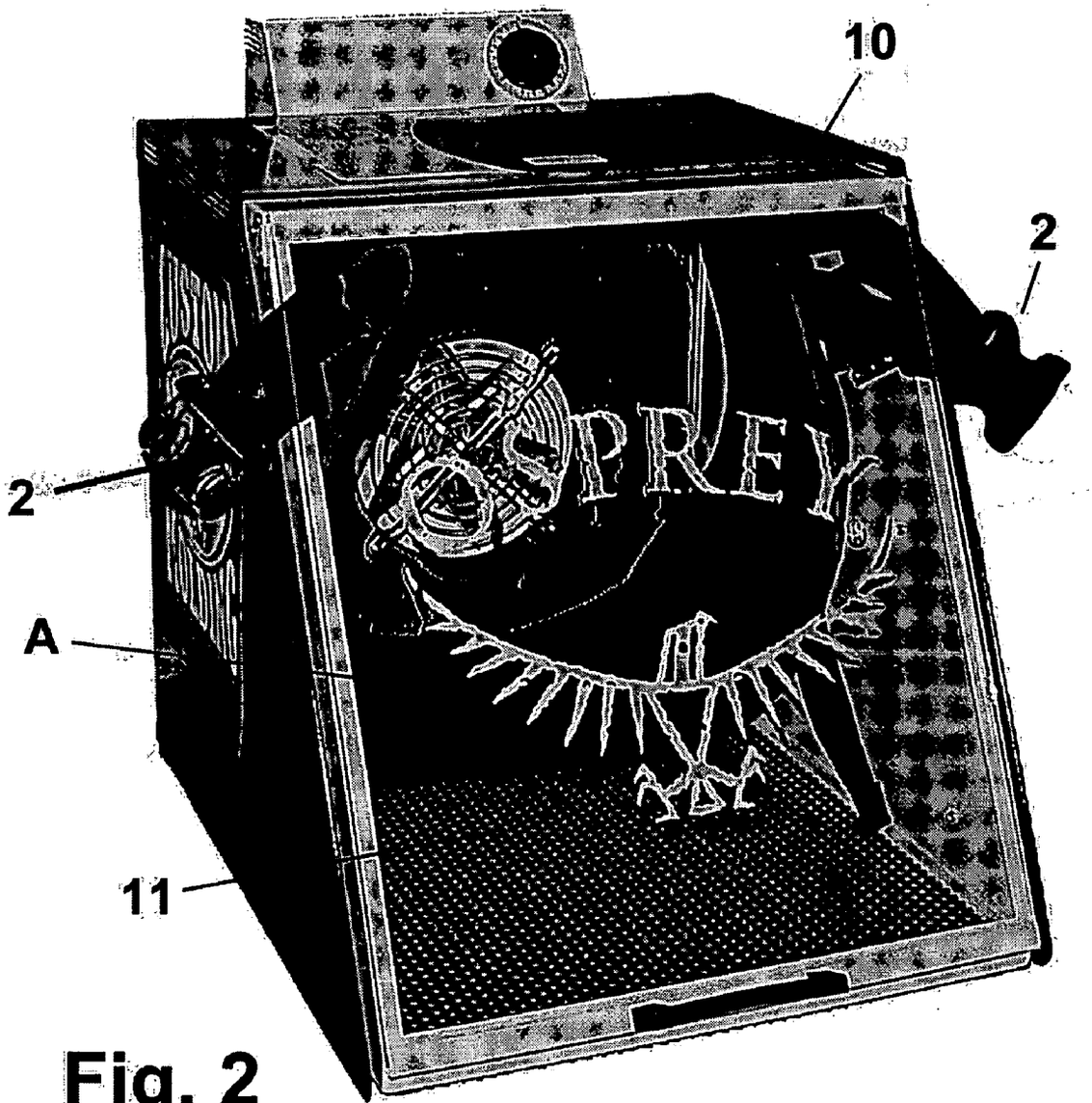


Fig. 2

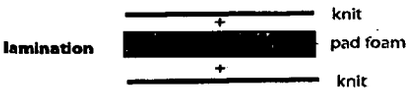


Fig. 3

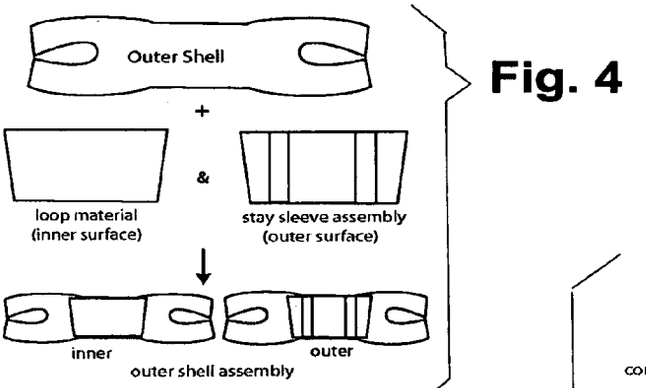


Fig. 4

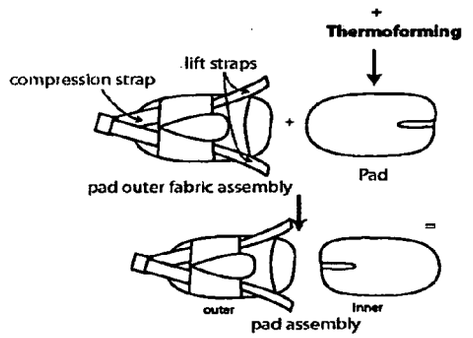
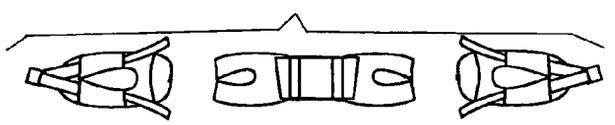


Fig. 5

Fig. 6



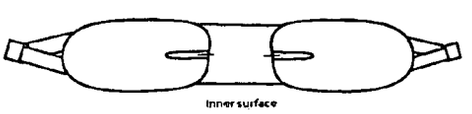


Fig. 7

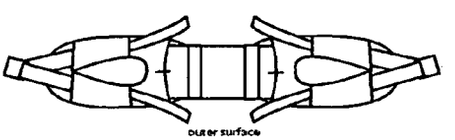


Fig. 8

CUSTOM MOLDED BACKPACK HIPBELT AND METHOD

RELATED APPLICATIONS

[0001] The present application is related to and claims priority to U.S. Provisional Application Ser. No. 60/583,011, filed Jun. 25, 2004 the contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to improvements in methods of adjusting backpacks to fit a user and is directed to a method of precisely molding a padded backpack hipbelt to the anatomy of a particular user to achieve a close and comfortable fit.

SUMMARY OF THE INVENTION

[0003] For maximum comfort of the user the load bearing contact points at the shoulders and hips are typically padded so as to help contour to the user's body and distribute the load fairly evenly without significant pressure points. Padding often consists of various types of flexible plastic or rubber-like foam compositions which may be chosen for their particular characteristics. Softer, more flexible or less dense foams will typically provide better ability to contour or conform to irregular shapes or adapt to varying shapes, while firmer, stiffer or denser foams may provide better weight bearing characteristics. By providing a method of accurately conforming a stiffer foam to the anatomical shape of a user it is possible to achieve a better balance of the benefits of both soft and firm foams.

[0004] It has long been recognized that the comfortable load capacity of a backpack is greatly enhanced by use of a hipbelt to support a substantial portion of the load in conjunction with the normal shoulder straps. Current hipbelts typically attempt to distribute weight over the hips of the user by providing a rigid structure with a soft interface. Such hipbelts are shaped to wrap comfortably around the hips of the user. However, they are most commonly based on an average model for contouring and rely on a high degree of conformability provided by the soft foam within the interface material. By providing custom post-production molding, the hipbelt of the present invention allows for personalized contour horizontally around the hips, cupping (the vertically oriented concavity) over the iliac crest, canting (the vertical tilt), and specific physical features (i.e., iliac crest location) of the user. Use of the custom molding of the present invention also allows the potential for using a denser or stiffer foam material which may be better suited to load bearing. Custom molding the hipbelt to a user achieves exceptional fit, weight distribution, and comfort.

[0005] In the present invention, a thermoplastic and/or thermo-moldable foam core is used within a sewn or laminated fabric shell to create a hipbelt blank. The exterior shell provided the structural strength necessary to allow the complete belt to support loads while the relative foam core provides padding and conformabilty to improve the comfort of the wearer when as belt bears the weight of a backpack or similar load. The blank is heated under controlled conditions to a temperature which is sufficient to allow the foam to be permanently deformable. The blank is then positioned on the body of the user as it would be worn and a load is simulated. The blank is given time to cool at which point it "sets" in a shape corresponding accurately to the body of the user. Because of the reasonably high temperatures necessary in order to achieve mold ability of the foam, the foam is heated using an oven or similar heating means which allows for heating only the necessary portion of the belt blank while avoiding heating of hardware such as the buckles for fastening the ends of the belt in use. This avoids any problems of heat damage to such hardware which might arise. More importantly, this avoids the possibility of injury or simple discomfort which might occur if the heated hardware should come in the contact with the user during the conforming process as is typically necessary when fastening the belt in place on the hips of a user. Even though such hardware is typically made of various structural plastic materials such as polycarbonate and acetal it has a much higher capacity for retaining heat (i.e. density and/or specific heat), and even if only heated to the molding temperature of the foam material, for example 210 degrees F., would create more of a risk of burn injury or discomfort to the user than is likely to occur from contact by the user with the heated foam material or the soft fabric and webbing components of the hipbelt.

[0006] It is an object of the present invention to provide a hipbelt for a backpack which is custom moldable to a user.

[0007] It is an object of the present invention to provide a custom molded hipbelt for a backpack which is more comfortable for the user.

[0008] It is an object of the present invention to provide a custom molded hipbelt for a backpack which provides an improved load carrying capability.

[0009] It is another object of the present invention to provide a hipbelt capable of using a very high density load bearing foam material for a backpack which is custom moldable to a user for greater comfort and utility.

[0010] It is another object of the present invention to provide a back pack hipbelt capable of using a foam material which is flexible to be conformable to a user and which is also moldable to be custom fit to a user for greater comfort and utility

[0011] It is another object of the present invention to provide a method of custom molding a belt for a backpack.

[0012] It is another object of the invention to provide a method of thermo-molding a backpack hip belt to fit a user while avoiding heating any hipbelt hardware which may come into contact with the user during the molding process so that the possibility of discomfort or burn injury to the user from heated hardware can be minimized or avoided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] **FIG. 1** is a perspective view of a backpack hip belt blank.

[0014] **FIG. 2** is a perspective view showing the exterior of an oven with a hipbelt blank in place within the oven cavity and the buckle ends of the hipbelt outside the oven cavity.

[0015] **FIG. 3** is a cross sectional view of the layers forming the laminated hip pad assembly.

[0016] **FIG. 4** is an exploded view of the components of the outer shell assembly.

[0017] **FIG. 5** is an exploded view of the components of the hip pad assembly.

[0018] **FIG. 6** is an exploded view of the components of the hip belt blank assembly.

[0019] **FIG. 7** is an plan view of the inner surface of the hip belt blank assembly.

[0020] **FIG. 8** is an plan view of the outer surface of the hip belt blank assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0021] In accordance with the present invention a moldable hipbelt blank is constructed using a core of suitable thermal moldable foam material. As examples, suitable materials include All EVA (ethyl vinyl acetate) foams of various densities. Those skilled in the art will recognize many acceptable alternatives which can be chosen depending on the particular characteristics desired. It is highly desirable to select a foam which may have sufficient conformablity in its ordinary state so that the hipbelt may be comfortably used even without being custom-formed. A benefit of EVA foam is that the temperature which it requires for semi-permanent molding is higher than typical temperatures which may be encountered by the belt after molding, even in the extremes that might be encounterd in, for example, the trunk of a car parked in the sun. This helps insure that the custom molded belt retains its shape after being custom molded.

[0022] The inner soft EVA foam is cut to ¾" thickness with enough surface area to accommodate the pattern pieces for pad portions for left and right sides of a belt. The inner foam is then assembled to a stretch woven nylon fabric on both sides using a high-temperature heat-activated film adhesive as illustrated in **FIG. 4** shown. This assembly is then heated to achieve lamination. The laminated assembly shown in **FIG. 3** is heated to approximately 240 degrees F. for approximately 5 minutes. This assembly is then placed in a hydraulic press under approx 20 tons of pressure for 10 minutes with the appropriate shaped and sized mold. This creates a hipbelt pad as shown in **FIG. 5** which is installed into a sleeve to become the final hipbelt blank A shown in **FIGS. 1, 7** and **8**.

[0023] The sleeve is comprised of nylon fabrics which are cut according to patterns and sewn together into the appropriate configuration order while inserting the main closure and attachment webbings. This creates the left and right hipbelt pad sleeve/backing. These sleeve/backing assemblies are then sewn to the appropriate pads to create a pad assembly. Additional suitable nylon fabrics and high density (HD) EVA approximately 0.25 in. are cut according to the patterns to become an outer sheath and shell. The sheath materials are sewn to nylon webbing and stay sleeves and then the HD-EVA outer shell to create the outer shell assembly shown in **FIG. 4**. The outer shell assembly is inserted into the left and right pad assemblies which are then individually sewn together, creating a hipbelt blank with substantial thickness and suitable for molding.

[0024] Hipbelt blanks are constructed as described above in several sizes which are selectable to provide initial fitting to a user. The molding process is accomplished using a completed blank appropriately sized and adjusted for a particular user.

[0025] A molding oven **10** is provided having a main heating cavity **11** capable of receiving a hipbelt blank A while allowing the ends of the belt and buckles **2** to remain outside the heating cavity. Alternatively the entire belt can be placed within the heating cavity with buckles ends insulated or otherwise covered or protected to prevent heating of the buckles. Generally, it is desirable to have the belt blank A hang freely within the cavity **11** of oven **10** during the heating process as shown in **FIG. 2**.

[0026] With these steps taken to prevent heating of the buckles, the hipbelt blank is placed into the oven cavity at approximately 210 degrees F. (100° C.) for approximately 10 minutes. Upon completion of the heating process, the hipbelt is fitted with a lumbar spacer pad for appropriate fit and placed on the user. The hipbelt is then tightened around the user's hips and thereby compressed (or cinched) until the inner foam layer is a barely separate from the outer foam layer (shell). The hipbelt is then loaded to simulate the force and direction of the a load of a weighted backpack. In order to simplify the molding process and minimize the time lapse between heating the blank and molding it to a user's hips, the preferred method of simulating such a load is to place the hipbelt blank by itself on the user's hips and have the user simply place his or her hands on the hipbelt to apply a slight downward pressure to mimic a weighted pack load Alternatively the heated hip belt may be attached to a backpack structure capable of providing an actual load comprising either an actual backpack or similar simulated structure which can be readily attached to the belt and worn by the user. This simulated or actual load is maintained for approximately 10-15 minutes while the hipbelt cools to just above room temperature. At this point the foam components of the hipbelt will have taken a permanent "set" and the belt will have been custom molded to the anatomical shape of the user. Typically a hipbelt blank can be re-molded several times if there is an apparent problem with the initial molding or if it is desired to reshape it for another user.

What is claimed is:

1. A custom molded hipbelt for a backpack, custom molded to fit a user, wherein the hipbelt comprises a belt blank assembly having a core of thermo-moldable foam material contained within a sewn or laminated shell,

wherein the belt blank assembly is heated to its point of permanent deformation,

while heated to its point of permanent deformation, the blank is molded to the shape of an wearer's hips and cooled below the temperature of permanent deformation.

2. A method of creating a custom molded weight supporting hipbelt comprising the steps of providing a belt blank assembly of a thermo-moldable foam material within a sewn or laminated shell,

heating the foam portion of the blank sufficiently to allow molding of the foam while preventing the heating of non-moldable hardware,

positioning the heated blank on the hips of a user as it would be worn in use, and

simulating a load as the foam material is cooled and set in a form custom molded to the user.

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