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(54) **Infusion in-mould helmet**

(57) A infusion in-mould helmet is disclosed. One side of a plastic sheet that is not resistant to high temperatures is attached with a protective tape that can withstand high temperatures, followed by printing, plastic removal, edge cutting, and hole drilling, to form an outer

helmet. The outer helmet and a pre-formed inner helmet are disposed together in a molding machine to render an integrally formed sports helmet at lower pressure, lower temperature, and shorter time.

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Description

BACKGROUND OF THE INVENTION

Field of Invention

[0001] The invention relates to a method of manufacturing sports helmets and, in particular, to the method of manufacturing infusion in-mould helmets.

Related Art

[0002] The structures of sports helmets, such as bicycle helmets, skate helmets, snow helmets, climbing helmets, and riding helmets, are more or less the same with a harder outer shell and a softer shock absorbing inner shell. However, higher-end helmets are integrally formed having a thin polycarbonate outer shell with the softer inner shell material injected into the outer shell so that the two parts are formed together. When impact occurs, the light harder shell and softer inner shell work together to absorb the shock. Such types of helmet are commonly called in-mold.

[0003] The above-mentioned outer helmets are usually made of costly polycarbonate. In view of the high cost of polycarbonate, manufacturers are forced to consider cheaper materials instead. In this case, PVC, PET, and PETG are potential substitutes. Nevertheless, these cheaper substitutes cannot withstand high temperatures during the forming process. The forming process thus has to be done at lower temperatures. But using normal processes, when forming at lower temperatures, the outer shell and inner shell cannot bond together.

SUMMARY OF THE INVENTION

[0004] In view of the foregoing, an objective of the invention is to provide in-mould helmet formed using lower temperatures but still creating an integral bond between the two shell materials. Plastic shell material that cannot withstand high temperatures (such as PVC, PET, PETG and others) is first printed and then thermoformed. And then the vents and the edges are trimmed to form an outer helmet. The outer helmet is then pressed together with a pre-formed inner helmet in a molding machine. They are integrally formed into a sports helmet at lower pressure, lower temperature, and shorter time.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The invention will become more fully understood from the detailed description given herein below illustration only, and thus is not limitative of the present invention, and wherein:

[0006] None.

DETAILED DESCRIPTION OF THE INVENTION

[0007] The present invention will be apparent from the following detailed description.

5 [0008] The invention is implemented as follows. Outer shell material that cannot withstand high temperatures (e.g., 90°C or more), such as PVC, PET, and PETG, is formed on thermo vacuuming machine. Afterwards, it is made into an outer helmet after printing, plastic removal, 10 edge cutting, hole drilling, and so on.

[0009] The PVC, PET, or PETG outer helmet thus formed is pressed together with a pre-formed inner liner (normally made from expanded polystyrene (EPS) or similar materials) in a molding machine. They are integrally formed into a sports helmet at lower pressure (0.5±0.1 bar), lower temperature (110±2 °C), and shorter time (168±5 sec).

[0010] The infusion in-mould helmet formed according to the above-mentioned method can have the same or similar appearance, functions, collision protection, and shock absorption as the conventional expensive polycarbonate outer helmet.

[0011] According to the above-mentioned infusion in-mould helmet, there is no gap between the PVC, PET, 25 or PETG outer helmet and the EPS inner helmet because they are integrally formed. This helps distributing the stress during a collision, thereby protecting the head.

[0012] The above-mentioned infusion in-mould helmet can prevent the problem of deformation due to direct sunlight as opposed to when the PVC, PET, or PETG outer shell is combined with the EPS inner helmet by glue or tape.

[0013] Although the invention has been described with reference to specific embodiments, this description is not meant to be construed in a limiting sense. Various modifications of the disclosed embodiments, as well as alternative embodiments, will be apparent to persons skilled in the art. It is, therefore, contemplated that the appended claims will cover all modifications that fall within the true scope of the invention.

Claims

- 45 1. An infusion in-mould helmet comprising an outer helmet formed by attaching a more heat-resistant protective tape onto one surface of a less heat-resistant plastic plate, followed by printing, plastic removal, edge cutting, and hole drilling, wherein the outer helmet and a pre-formed inner helmet are disposed together in a molding machine to integrally form the in-mould helmet at lower pressure, lower temperature, and shorter time.
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- 55 2. The infusion in-mould helmet of claim 1, wherein the material of the outer helmet is PVC.
3. The infusion in-mould helmet of claim 1, wherein the

material of the outer helmet is PET.

4. The infusion in-mould helmet of claim 1, wherein the material of the outer helmet is PETG.

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5. The infusion in-mould helmet of claim 1, wherein the material of the inner helmet is expanded polystyrene (EPS).

6. The infusion in-mould helmet of claim 1, wherein the pressure for infusion is not more than 0.7 ± 0.1 bar.

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7. The infusion in-mould helmet of claim 1, wherein the temperature for infusion is not more than 110 ± 2 °C .

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8. The infusion in-mould helmet of claim 1, wherein the time for cold fusion is not more than 168 ± 5 sec.

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