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AVOIDING BREAKAGE OF 3D-PRINTED ANKLE-FOOT ORTHOSES

HP INC

Avoiding Breakage of 3D-Printed Ankle-Foot Orthoses

Abstract: A 3D-printed cable tie attaches the flexible parts of an ankle-foot orthosis during manufacturing and shipment in order to reduce or eliminate breakage of the orthosis.

This disclosure relates to the field of additive manufacturing.

A technique is disclosed that reduces or eliminates breakage in 3D-printed ankle-foot orthosis braces without adversely impacting either the design of the AFO or the cleaning and dyeing processes of its manufacture.

The manufacturing process of a 3D-printed ankle-foot orthosis (AFO) requires a number of steps: 3D-printing the AFO's hard-shell, cleaning the parts, post-processing them to improve the aesthetics of the product (dyeing, etc), and final assembly to manufacture the complete product by adding foam, padding, etc. Focusing on the hard-shell part, there are 3 different steps that affect the quality of the product: printing, cleaning, and dyeing. Depending on the design of the parts, some features can break during cleaning and dyeing. During the cleaning process, the different parts printed within the same bucket are put together into a type of washing machine and are cleaned during interaction with the cleaning media and the other 3D printed parts. However, during this process there are a lot of collisions, and breaks often occur when there are parts of different volumes and weights being cleaned together. Controlling the parts that are put on the cleaning machine is not always possible.

An AFO can be subject to breakage because the front cuff and the straps must be very flexible so that the user can attach the AFO to their legs. As a result, the design can't be rigidized to avoid these breaks. Similarly, the cleaning process often can't be tuned to reduce the stresses on the AFOs and still properly clean them, such as ensuring that all powder is eliminated from the parts. One alternative is to print parts within a mesh cage or box which protects the product from collisions. However, doing so limits the packing density of the plot and increases the ink and powder consumption and thus the cost.

According to the present disclosure, and as understood with reference to the Figure, a 3D-printed orthosis 10 includes an additional 3D-printed cable tie to limit the existing movement between the parts of the AFO during the post-processing steps and shipment processes. In one example, an interlocking 3D-printed cable tie closes both parts of the flexible front cuff. This ensures that the parts are not moving during the cleaning process and thus the collisions with other parts are less severe, improving the yield by avoiding breakage. The cable tie is easily cut and removed after post-processing without adversely impacting product performance. In some examples, the tie can remain intact during shipment to provide additional protection and is removed by the end user.

The disclosed technique advantageously increases product yield without adversely affecting product performance during post-processing and, in some cases, shipment. Product packaging can provide hooks or other mechanisms that attach to the cable tie during shipment to provide additional product protection. In addition, identifying labels for the product can be placed or fabricated on the cable tie instead of on the main body of the AFO itself.

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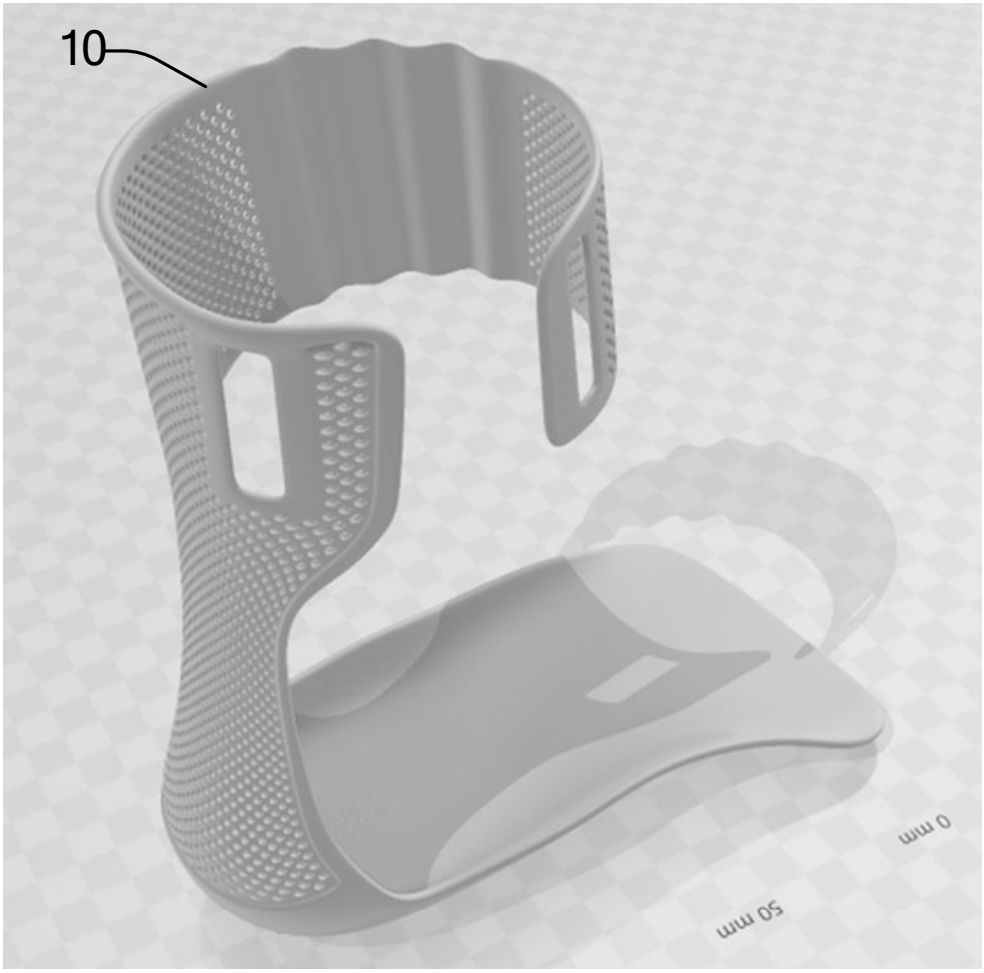
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