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(54) Title: **THREE-DIMENSIONAL, AMORPHOUS-PATTERNED, NESTING-RESISTANT SHEET MATERIALS AND METHOD AND APPARATUS FOR MAKING SAME**

(57) Abstract

The present invention relates three-dimensional sheet materials which resist nesting of superimposed layers into one another. More particularly, the present invention provides a three-dimensional, nesting-resistant sheet material having a first side and a second side. The first side comprises at least one region having a plurality of spaced three-dimensional protrusions extending outwardly from the first side which are preferably unitarily formed from the sheet material. To provide the nesting-resistant advantages of the present invention, the protrusions form an amorphous pattern of a plurality of different two-dimensional geometrical shapes. Preferably, the second side comprises a plurality of spaced, three-dimensional hollow depressions corresponding to the protrusions, such that the protrusions are hollow. Of particular interest for certain applications, such as a carrier for an adhesive, the protrusions are separated by an interconnected network of three-dimensional spaces between adjacent protrusions. The three-dimensional, nesting-resistant sheet materials are preferably manufactured in accordance with the present invention utilizing a three-dimensional forming structure comprising an amorphous pattern of spaced three-dimensional recesses separated by interconnected lands. The recesses form an amorphous two-dimensional pattern of interlocking two-dimensional geometrical shapes. The amorphous pattern of interlocking shapes is preferably derived from a constrained Voronoi tessellation of 2-space in accordance with the present invention, wherein the tessellation is constrained by a constraint factor which controls the range of permissible center-to-center spacing of the interlocking shapes. To manufacture the three-dimensional, nesting-resistant sheet materials in accordance with the present invention, a sheet of deformable material is introduced onto the forming structure and permanently deformed into compliance with the forming structure. If desired, the interconnected lands of the forming structure may be coated with a substance before the sheet of deformable material is introduced onto the forming structure.

