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(54) Title: COMPOSITE STRUCTURAL ELEMENTS AND METHOD OF MAKING SAME

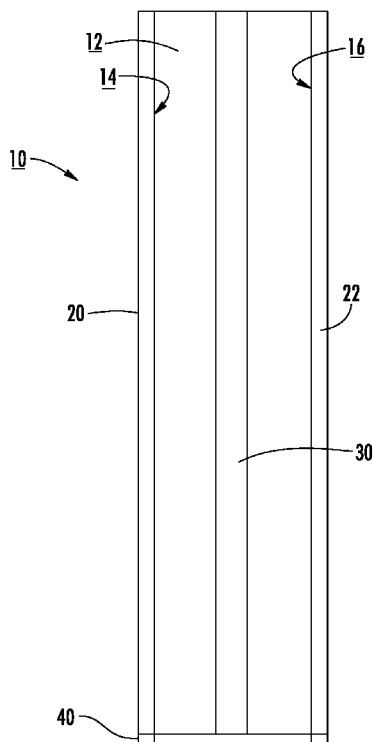


FIG. 1

(57) Abstract: A composite structural element and a method for making same are provided. The element includes a polymer foam core and at least one fibrous layer adhered to the polymer foam core by epoxy. Nano-particles are suspended in the epoxy prior to curing; preferably they are mixed with the hardener before it is mixed with the resin. The polymer foam core is preferably an exothermic foam such as polyurethane, and heat generated by the exothermic foam cures the epoxy, thereby causing the fibrous layer to adhere to the foam core. The nano-particles may be made from at least one of carbon, a ceramic, tungsten, a carbide, titanium, zircon, aluminum, silver, or boron. When carbon nano-particles are used, the strength of the composite is greatly increased, and the curing time of the heat-curable epoxy is significantly reduced. Ceramic nano-particles can be used to increase penetration resistance and provide increased ballistic protection.



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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 8 as above

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Utility models and Applications for Utility models since 1975

Japanese Utility models and Applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 5-318642 A (NIPPON OIL CO., LTD.) 2 December 1993 see claims 1-6, [0004], [0005], [0018]	1-26, 29
X Y	JP 2008-31193 A (TORAY INDUSTRIES, INC.) 14 February 2008 see [0010]-[0013], [0047]-[0049]	27, 28, 30-37 1-26, 29
A	US 6,117,376 A (MICHAEL MERKEL) 12 September 2000 see the whole document	1 - 37
A	WO 02/09934 A1 (DURAKON INDUSTRIES, INC.) 7 February 2002 see the whole document	1 - 37
A	JP 2001-246686 A (TOYOTA AUTOMATIC LOOM WORKS, LTD.) 11 September 2001 see the whole document	1 - 37

 Further documents are listed in the continuation of Box C. See patent family annex.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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JP 2001-246686 A	11.09.2001	None	