(54) Title: SMART PADDING SYSTEM UTILIZING AN ENERGY ABSORBENT MEDIUM AND ARTICLES ABTAINABLE THEREFROM

(57) Abstract: The present invention relates to an energy absorbent medium which is compliant and conformal in the absence of an applied force, and stiffens in proportion to the rate of an applied force to dissipate energy. A polymeric based material composition comprising the medium offers absorption and dispersion of impact energy that is directly proportional to the rate of force applied. The polymer composition medium comprises a blend of a polymer, a lubricant and a filler to produce a conformal absorbent which exhibits dilatant (shear thickening) characteristics under high rates of force or stress. The novel medium comprises a diluent extended crosslinked viscoelastic polymer composition. The polymer has reformable sacrificial chemical bonds which are preferentially broken under a high rate of deformation and which reform under static conditions. Typical applications of this medium include absorbent for sports padding, athletic equipment, motor vehicle seats, bulletproof vests, medical equipment, industrial equipment, weaponry, and athletic playing fields.
1. An energy adsorbent medium comprising a blend of 20 to 90% by wt polymer having substantial no flow at temperatures of about 20° except upon application of a force, 20 to 60% by wt lubricant and up to 90% by wt filler, said polymer exhibiting hydrogen bonding and said lubricant being a liquid or paste.

2. An energy adsorbent as set forth in claim 1 wherein said polymer is selected from the group comprising polyborosiloxane, xanthan gum, guar gum and polyvinylalcohol tetraborate.

3. An energy adsorbent as set forth in claim 1 or 2 wherein said filler comprises microsphere, pulps, fibers, microcellular foam, closed-cell foam, powdered plastic, ceramics or metals.

4. An energy adsorbent as set forth in claim 1 wherein said polymer is polyborosiloxane.

5. An energy adsorbent as set forth wherein said polymer comprises 70% by wt polyborosiloxane, 20% by wt hydrocarbon based lubricant and 10% by wt filler.

6. An energy absorbent medium as claimed in Claim 1 wherein said polymer composition comprises a plasticized cross-linked, viscoelastic polymer composition, the polymer having reformable sacrificial chemical bonds which are preferentially broken under high shear conditions and which reform under low stress conditions.

7. A method for forming a self conforming, compliant energy adsorbent medium comprising the steps of blending 20 to 90% by wt polymer exhibiting hydrogen bonding and having substantial no flow at 20% except upon application of force, 20 to 60% by wt of a liquid or paste lubricant and up to 20% by wt of a filler to form a viscoelastic, rheologically dilatent plasticized polymer composition.

8. A method as set forth in claim 7 wherein said polymer is selected from the group comprising polyborosiloxane, xanthan gum, guar gum and polyvinylalcohol sodium tetraborate.

9. A method as set forth in claim 7 wherein said polymer is polyborasiloxane and said lubricant is a hydrocarbon.

10. A self compliant energy adsorbent comprising a viscoelastic rheological dilatent polymer composition set forth in claim 7.