Bullet-Proof Vest, Soft Body Armor of Antiballistic Fabric

Technology #d-0396

Bullet-Proof Vest Made from Anti-Ballistic Fiber Protects from Bullets, Shrapnel, Small Arms Projectiles

The bulletproof or bullet-resistant vest is an important form of soft body armor, used by police forces around the world. These types of padded personal armor help absorb the impact from bullets, shrapnel, and other high impact projectiles. Even though bullet-proof vests greatly reduce the risk of dying from gunfire, many law enforcement officers choose not to use ballistic protection because it can be very uncomfortable to wear.

This new approach to making bullet-resistant vests, using a non-woven fabric next to the skin, addresses some of the wearability issues that keep officers from using soft body armor on a regular basis. The non-woven textile layer in these ballistic vests also makes the material stronger, lighter, and more flexible than currently available vests, while still being able to protect the wearer from small arms projectiles.

Bullet-Proof Armor Protects Police, Military, Hunters

Ballistic personal protective equipment such as bullet-resistant vests, are used by law enforcement agencies, police services, military personnel, security guards, and body guards around the world. According to the National Law Enforcement Officers Memorial Fund, on average, one law enforcement officer is killed somewhere in America nearly every 53 hours, and gunfire has been the number one cause of death for police officers over the past 20 years. An estimated 250,000 officers in the U.S. are not provided with body armor.

In addition, many private citizens use soft body armor for protection during hunting, sports, and for personal protection. According to statistics from the Hunting Education Association, about 90 people die in hunting accidents in North America each year. Soft body armor provides adequate protection against handguns, hunting rifles, knives and swords, blunt objects, and other potential hazards to private citizens.
Bullet-Proof Vest is Made from Antiballistic Fabric that Provides Protection and Comfort

This ballistic personal protective equipment design is made of multiple layers of fabric. The outer layer is made of a sturdy, abrasion-resistant material, such as leather. The inside padding is made of multiple layers of antiballistic polyethylene fibers, such as Spectra® fabric by Honeywell. Below that, next to the skin, is a layer of non-woven fabric, created by needle punch technology, that provides comfort properties, as well as impact resistance.

This non-woven antiballistic fabric is produced using needle punching technology. A needle punching loom entangles, bonds, and compacts loose fibers to form a fabric by the up-and-down action of thousands of barbed needles. The structure allows greater compressibility than woven fabrics and therefore more impact protection. Also, the fiber orientation can be controlled and aligned to improve strength, while still maintaining flexibility. The greater flexibility of the non-woven fabric provides less resistance to movement, making it more comfortable for daily wear.

The non-woven fabric is breathable, wicks moisture, and reduces odor, which is an improvement over existing personal armor which can be hot to wear and causes perspiration build-up. The non-woven layer can be produced from many types of fibers allowing the fabric to be customized for specific characteristics of warmth, wicking ability, or added ballistic protection.

Ballistic Protection with Fewer Anti-Ballistic Layers

The use of a resistant outer layer combined with the flexible non-woven under layer in this ballistic vest was shown in tests to reduce the overall number of anti-ballistic layers needed to provide Level II-A ballistic protection (the minimum requirements for soft body armor under NIJ Standard-0101.06 http://nij.gov/pubs-sum/223054.htm). Requiring fewer anti-ballistic layers in manufacturing, the vests are less costly than other anti-ballistic armor, and they weigh less, about 8 pounds, which improves wearability.

Antiballistic properties were also tested and confirmed to have a V50 ballistic limit (according to US military standard MIL-STD-662F) which requires that the body armor stopped half of the bullets fired at it.

Applications

- law enforcement agencies
- police services
- military personnel
- security guards
- body guards
- hunting
- shooting sports
- sport fencing
- martial arts
- personal protection
- protection against handgun assaults
- protection against shotguns
- protection against knife attacks
- protection against attack with a blunt object
Advantages

- Requires fewer anti-ballistic layers to achieve Level II-A protection
- Fewer antiballistic layers results in cost savings
- Fewer antiballistic layers reduce the weight of each vest
- Needle-punched fabric provides greater compressibility and more impact protection than woven fabric
- Needle-punching loom allows control of fiber orientation and alignment which improves strength, while still maintaining flexibility
- Greater flexibility of the non-woven fabric provides less resistance to movement, making it more comfortable to wear
- Non-woven fabric is breathable, wicks moisture, and reduces odor
- Non-woven layer can be produced from many types of fibers, allowing the fabric properties to be customized

Inventors

Dr. Seshadri Ramkumar, Associate Professor

Dr. Ramkumar specializes in non-woven materials and counter measures to biological and chemical threats.