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Active Knit Compression Garment Portfolio (20170290)

A portfolio of shape memory alloy (SMA) functional active knits offers several types of wearable compression garments as well as a novel process for creating them. Technology #20170290-20180107-20180120-20180298

20170290: Functional textiles through multi-material 3D printing

A new process creates uniquely functional/active textiles using multi-material 3D printing combined with traditional textile equipment (e.g., circular knitting machine). The process involves 3D printing novel, yarn-like filaments with strategically varying properties (elasticity/stiffness, conductivity, activation, surface properties, etc.) that can later be formed into a textile/garment.

Benefits

- Multi-material 3D printing combined with traditional textile equipment creates unique functional/active textiles
- Filaments can be used in functional/smart garments

Phase of Development

- 20170290 - Concept

20180107: Applies pressure when warmed/activated by skin temperature

This functional compression garment clothing activates upon touching the body and self-fits to the body without a power source. The SMA activated compression garment is passive and loose fitting when cool (i.e., ambient room temperatures or even freezing temperatures) and activates to apply pressure on the body as it warms to skin temperature. This approach enables new, dynamic, wearable compression garments with controllable activation and low effort donning and doffing.

Benefits

- Dynamic, mobile, and untethered
- No power source required; activates when warmed to skin temperature
- Easy donning and doffing

Phase of Development

- Prototype developed and characterized

20180120: Dynamic compression for therapeutic relief

This SMA compression garment provides **dynamic compression** for therapeutic relief. The garment features nickel titanium (NiTi) alloy SMA spring actuators that contract with heat to provide compressive force when electrical power is applied. A novel tension-limiting switch gives patients independent control of compression by applying electrical power to SMA actuators to

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Category
Engineering & Physical Sciences/Design Specifications
Engineering & Physical Sciences/Instrumentation, Sensors & Controls
Engineering & Physical Sciences/Materials
Life Sciences/Medical Devices

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provide compressive force. The tension switch can also prevent patients from applying an incorrect amount of power and/or overheating the SMA springs. The unique feedback mechanism of the tension switch consumes no electrical power; it instead uses the mechanical properties of its material.

Benefits

- No external power source required
- Dynamic compression control
- Requires less human intervention
- Separate, adjustable calf and thigh garments; easy to wear outside of clinical environments
- Closed-loop sensing system

Phase of Development

- Prototype developed and characterized

20180298: Self-fitting, variable stiffness textiles

This technology uses SMA knitted actuators in a novel way to create self-fitting, on-body clothing and wearables. The technology leverages large and controllable displacements, and variable stiffness qualities to make textiles that are compliant and flexible in their inactive state, and become stiffer in their active state. SMA textiles are temperature sensitive and could actuate using the body's thermal energy or other forms of heating. This textile could be used in conjunction with high-force SMA textiles in a single garment to provide the necessary fitting for appropriate force output. This material could be used in place of commonly used fasteners/fitting mechanisms, such as lacing, hook and loop tape, ratcheting systems, hooks and eyes, zippers, and snaps.

Benefits

- Leverages large, controllable textile displacements and variable stiffness qualities
- Improves fit adjustability
- Helps reach lower extremities or other difficult to reach areas
- Requires little/no manual dexterity or hand/upper-body strength to accomplish fitting

Phase of Development

- Prototype developed and characterized

Applications

- Compression garments
- Smart/functional garments
- Medical wearables/garments: orthostatic hypotension (OH), deep vein thrombosis (DVT), lymphedema, and Parkinson's disorder, tourniquets postural orthostatic tachycardia syndrome (POTs)
- Athleisure
- Anti-gravity suit (AGS)
- New "fitting" mechanism for any garment requiring close fit (e.g., belts, corsets, bras, shapewear, suspenders, shoes, etc.)

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact us to share your business' needs and learn more.

Researchers

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