IPRO 332

Tournitech

Smart Clothing Technology

Semester 1 of 2

Techniques Considered

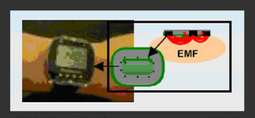
Infrared Spectroscopy
- Infrared light beamed through skin
- Glucose molecules absorb specific frequency
- Detects glucose and lactic acid
- Expensive and difficult to miniaturize

Dielectric Spectroscopy
- Ultrasound increases permeability of skin
- Interstitial fluid used to measure glucose
- More accurate than Infrared Spectroscopy
- Results in 10-15 minutes; too long

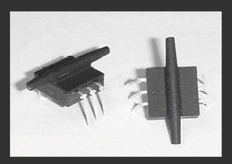
Automatic Pump
- Armband tightens and restricts blood flow
- Uses a small air pump to inflate chamber
- Release valve for excess pressure
- Requires power supply

Manual Pump
- Bulb is pressed repeatedly to inflate chamber
- Similar to familiar Reebok Pump
- Valve can be pressed to deflate chamber
- Cheap and easy to use

Blood Pressure Sensors
- Used to release excess pressure in cuff
- LCD display to show measurements
- Safer than fully manual device
- Sensors are inexpensive

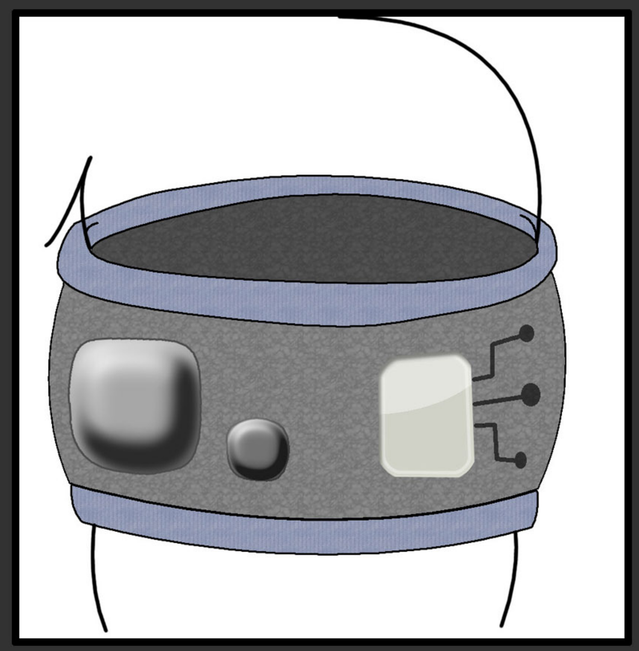


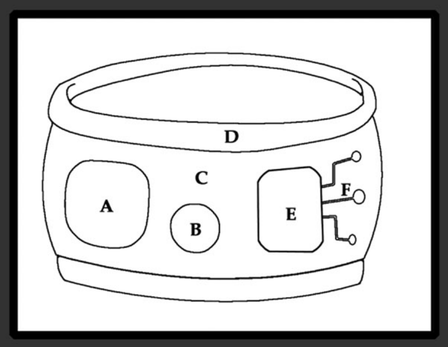
Dielectric Spectroscopy Unit


Blood Pressure Sensors


Reebok Pump Shoes

- When exercising, small muscle fibers perform aerobic respiration.
- Large muscle fibers perform anaerobic respiration.
- Small muscle fibers are used for endurance, and large fibers for strength.
- By depriving muscles of oxygen, large muscle fibers are used earlier in exercise, before fatigue sets in.
- Restricts blood flow so as to deprive muscles of oxygen, therefore boosting muscle development.





A: Inflation bulb, pressed repeatedly to fill air chamber (C)
B: Release valve, pressed once to release air from chamber. Automatically releases excess air pressure.
C: Air chamber, inflates around arm to restric blood flow
D: Elastic cuff, holds armband on when (C) is deflated
E: LED display/control unit, governs blood pressure sensors, shows blood pressure measurements
F: Blood pressure sensors, monitor blood pressure

Design Advantages

- Absense of glucose monitoring hardware reduces cost
- Manual pump is easy to use, and consumers are familiar with the concept, thanks to Reebok Pump shoes.
- Manual pump eliminates need for mechanical pump, which would require a larger power supply as well as increase cost and size.
- Release valve and blood pressure sensors allow excess pressure to be released and helps user avoid injury.
- Blood pressure sensors are inexpensive.
- LCD display shows blood pressure and instructs user to release air pressure with valve.

Future Objectives

- Research long-term health concerns
- Eliminate sweat in order to utilize spectroscopy
- Develop method to govern cuff inflation
- Cost analysis for materials, incorporation into athletic clothing, and prototype design
- Develop design specifications
- Alternate methods of limb occlusion

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"Tournitech: the science of winning!"