Product Design Specifications

Neck Extender & Flexor for Fluoroscopy Examination

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Client:
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Problem Statement: Our project involves creating a motorized neck positioner for a patient during fluoroscopy examination. The device must allow for extension and flexion of the head and cannot interfere with lateral radiographic imaging.

Client Requirements:
- must extend and flex the patient’s neck
- the prototype must not interfere with fluoroscopic imaging
- must be remote control operated
- the design must be universal to all fluoroscopic imaging systems

Design Requirements:

Physical and Operational Characteristics

a. Performance requirements:
   - 45° of extension and flexion from a horizontal resting position
   - Rate of rotation must be constant (approximately 1/second)
   - Device should result in a natural rotating motion of the neck
   - Motorized mechanism to facilitate movement
   - Remote control operable from another room
b. Safety:
   - Poses no risk of new or worsened neck injuries
   - Doesn’t impair or damage the fluoroscopy machine
c. Accuracy and Reliability:
   - Reliably functions when operated by remote control
   - Accurately simulate natural cervical vertebrae movement and rotation
d. Life in Service:
   - Can handle at least ten patients per day
   - Lifespan of at least two years
   - Smaller components replaceable for maintenance
e. Shelf Life:
   • Storable in room temperature sheltered environment
   • Functional after extended periods of idle time
   • Requires minimal maintenance
f. Operating Environment:
   • Tolerate repeated exposure to x-rays from fluoroscopic imaging machine
   • Withstand wear and tear from operation and movement by hospital staff
   • Circuitry protected from damage due to humidity, fluid spills, temperature, or other adverse conditions
g. Ergonomics:
   • Remotely operated (reduces X-ray exposure to staff)
   • Easy to position patient on device
h. Size:
   • Appropriately fitted to dimensions of fluoroscopy examination table
   • Easily removable and storable
   • Easy maintenance and modification
i. Weight:
   • Less than 20lb, so it can be handled by staff
   • Heavy enough to ensure stable operation
j. Materials:
   • Metallic materials are not permissible in the area of examination (will interfere with X-ray signal
k. Aesthetics, Appearance, and Finish:
   • Blend appropriately with existing hospital machinery (white)
   • Smooth edges and texture to prevent injury during operation
   • Can be sterilized between patients without damage to components

**Production Characteristics**

a. Quantity:
   • One prototype, this semester
   • Potential to mass produce if marketable
b. Target Product Cost:
   • Less than $250 for prototype construction this semester
   • At most $1000-$2000 for final product construction and material costs
   • Final product market value of approximately $10,000

**Miscellaneous**

a. Customer:
   • Accommodate average sized adult
   • Patient may be unconscious or obtunded
b. Competition:
   • Patent search revealed no similar devices
     Individual components of design may be patented