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