Accessible Syringe Dosing Device: Project Specifications
I. INTRODUCTION

In recent years, many independent adults have indicated a need for a method of accurately controlling the doses of their intravenous medications. Millions of people rely on self-medicating techniques that require the use of syringes. Those suffering from type II diabetes, and therefore are insulin dependent, or stroke patients, who use precautionary heparin injections, are some of the patients who most commonly use syringes. Self-dosing can be problematic for many people, especially those who are elderly, visually impaired, or hearing impaired, or suffer from arthritis, Parkinson’s disease, partial paralysis, or the loss of motor skills due to a stroke, heart attack, or other physical ailments. Clearly, there is a need for a reliable, easy-to-use, and inexpensive product to accurately fill syringes with insulin or heparin in a timely manner.

Products currently on the market require patients to mechanically fill their syringes, using their fine motor skills to control the syringe mechanism. This method increases the risk of errant dosing by relying on the patient’s physical ability to perform the dosing correctly. The current products, therefore, do not accommodate patients that lack the fine motor skills necessary for correct use. The product described here will provide a digital self-dosing device that will accommodate many of the physical limitations mentioned above, while remaining affordable and competitive in today’s market.
II. OVERVIEW

This new product has several important basic requirements. It needs to be accessible for people who are hearing impaired, vision impaired, and who lack certain motor functions. Because most of the products already on the market accommodate those who are hearing impaired and vision impaired, the feature that will set this product apart from the others is that it will not require fine motor skills for operation. It must, of course, accurately dose the user’s medication to the nearest 0.01cc. The accessible syringe dosing device must also, as its title implies, be compact, easy-to-use, and cost effective. The device proposed here will employ a digital dosage display with easy-to-use buttons to increase and decrease the volume of medication by one unit. The product’s digital display will be controlled by a microprocessor, which will be connected to an electrical system with rechargeable batteries. The product will employ a gear system that will accurately draw the syringe to deliver a reliable dose to any patient. Once complete, the projected cost of the product will be between $40-60. The projected specifications for this device are presented in tabular form below.

Technical Specifications

**Electrical Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery life</td>
<td>6 months</td>
</tr>
<tr>
<td>Display</td>
<td></td>
</tr>
<tr>
<td>Number of characters</td>
<td>5 minimum</td>
</tr>
<tr>
<td>Significant Figures</td>
<td>4</td>
</tr>
<tr>
<td>Height</td>
<td>5cm maximum</td>
</tr>
<tr>
<td>Width</td>
<td>7.5cm maximum</td>
</tr>
<tr>
<td>Illumination</td>
<td>bright display to accommodate elderly and vision impaired</td>
</tr>
</tbody>
</table>

| Motor               |                                   |
| Voltage             | 3-9 volts                         |
| Power Usage         |                                   |
User Interface
Voltages
Impedances
Gains
Power Output
Power Input
Ranges
Current Capabilities
Stability
Accuracy 0.01cc
Precision
Power Consumption

Mechanical Parameters
Buttons 5 minimum (Increase, Decrease, Preset, Enter, On/Off)
Button Size 5cm by 5cm. maximum
Weight 2kg maximum
Vibration Operates normally in trembling hand
Durability No adverse effects after 2m drop (hard surface)
Size 10cm wide by 30cm high maximum

Gears:
Number 2 minimum
Weight 500 grams maximum
Life 1,000,000 uses
Ratio 1:10:2 minimum

Environmental Parameters
Operating Temperature 0-100 degrees C
Storage Temperature 0-100 degrees C

Hardware and Software Parameters
Microprocessor:
Programming programmed in C++
Memory 5 M minimum

Machine Dependent:
Wait times 2 min maximum
Increase/Decrease Dose 2 buttons
Preset 1 button
On/Off 1 button