MaxCline Adjustable Exercise Bench

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Abstract

Inclined and declined body positions are utilized in order to isolate specific muscle groups during resistance training. Currently, there are two options that exist in order to achieve both positions. One option lacks range of motion while the other requires two separate pieces of equipment. This project offers a solution to both of these problems in an innovative and technical manner.

Design Development and Goals

The initial design was intended to pivot or lift at both ends in order to achieve maximum incline and decline angles. However, this involved a large number of moving parts, greater manufacturing costs, and an increased probability of malfunction. The major design challenge was to achieve maximum range of motion while maintaining ease of use. The most important design specifications required the bench to:

- Support maximum weight safely
- Adjust easily
- Incline and decline to a vertical position

Final Design

Key Design Features Include:

- Fully vertical incline and decline positions
- Small angle increments allow for more adjustability
- Wheels for easy transport
- Wide footprint increases stability
- Removable leg restraint allows easy transition between incline and decline positions

Prototype

A prototype was built in order to convey the main design features of the MaxCline. Due to cost and time constraints, wood and brackets replaced steel and welds respectively. The prototype allowed for a greater understanding of physical compatibility with the human body which the CAD model could not convey.

Benchmarking

Three benchmarks were chosen in order to evaluate all existing competition. The existing flat/incline/decline all-in-one benches do not have a full range of motion, and thus are not a popular option among athletic clubs. Two separate benches, a flat/incline and a flat/decline, are more commonly used. However, using two benches is inefficient in terms of cost and floor space.

Table 1. Bench Comparisons

<table>
<thead>
<tr>
<th>Description*</th>
<th>F/I</th>
<th>F/D</th>
<th>F/I/D</th>
<th>F/I/D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Incline</td>
<td>90°</td>
<td>0°</td>
<td>80°</td>
<td>90°</td>
</tr>
<tr>
<td>Maximum Decline</td>
<td>0°</td>
<td>45°</td>
<td>15°</td>
<td>45°</td>
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<tr>
<td>Cost</td>
<td>$795.00</td>
<td>$895.00</td>
<td>$1095.00</td>
<td>$1690.00</td>
</tr>
<tr>
<td>Footprint</td>
<td>30” x 47”</td>
<td>32” x 66”</td>
<td>37” x 67”</td>
<td>“62” x 66”</td>
</tr>
<tr>
<td>Weight (lbs)</td>
<td>75</td>
<td>90</td>
<td>120</td>
<td>165</td>
</tr>
</tbody>
</table>

* F = Flat, I = Incline, D = Decline
** Total footprint based on side-by-side positioning
*** Benchmark specifications and cost [1]

Acknowledgments

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References

2. Solidworks – 3D CAD Software