INTRODUCTION
There are two general types of body-powered prehensors. With voluntary-opening (VO) prehensors the user pulls on their cable to open the device but can then relax and allow the prehensor to grasp an object using the force supplied by rubber bands. VO devices are easy to use but the rubber bands provide a weak grasp force. Voluntary-closing (VC) prehensors require the user to pull on the cable to close the device. They enable the user to apply a large pinch force—as large as the user can generate, but are more difficult to use because continual user-generated force is required to maintain any pinch force; if the user relaxes then they will drop any object they are holding unless a locking mechanism is used.

METHOD
We have developed an innovative, simple switching system that allows the user to easily switch between VO and VC modes using a basic linkage (Figure 1). Thus the most useful features of VO and VC devices can be combined in a single VO/VC device; one that is easy to operate in the VO mode for light duty, but that can provide high pinch force, in the VC mode, when needed.

RESULTS
Our VO/VC prehensor has a low weight of 130g—similar to the lightest adult split-hook (#5XA, 113g), and is the same size as the Sierra 2-Load VO Hook (Figure 2). Our VO/VC prehensor provides a relatively linear gear ratio, has 100% efficiency, and does not break under the largest forces a user can exert.

DISCUSSION
VO/VC devices may allow prosthetic hands to become more functional in the near future, and are particularly well suited for a developing world context, where both cosmesis and function are often required.

CONCLUSION
We have developed a simple, inexpensive VO/VC body-powered terminal device that combines the best of VO and VC devices.

CLINICAL APPLICATIONS
This device could be used clinically in the near future, after further refinement of the switch and spring mechanisms.

REFERENCES