

## CURRENT UNB PROJECTS

### Wrist Unit for Wrist Disarticulation:

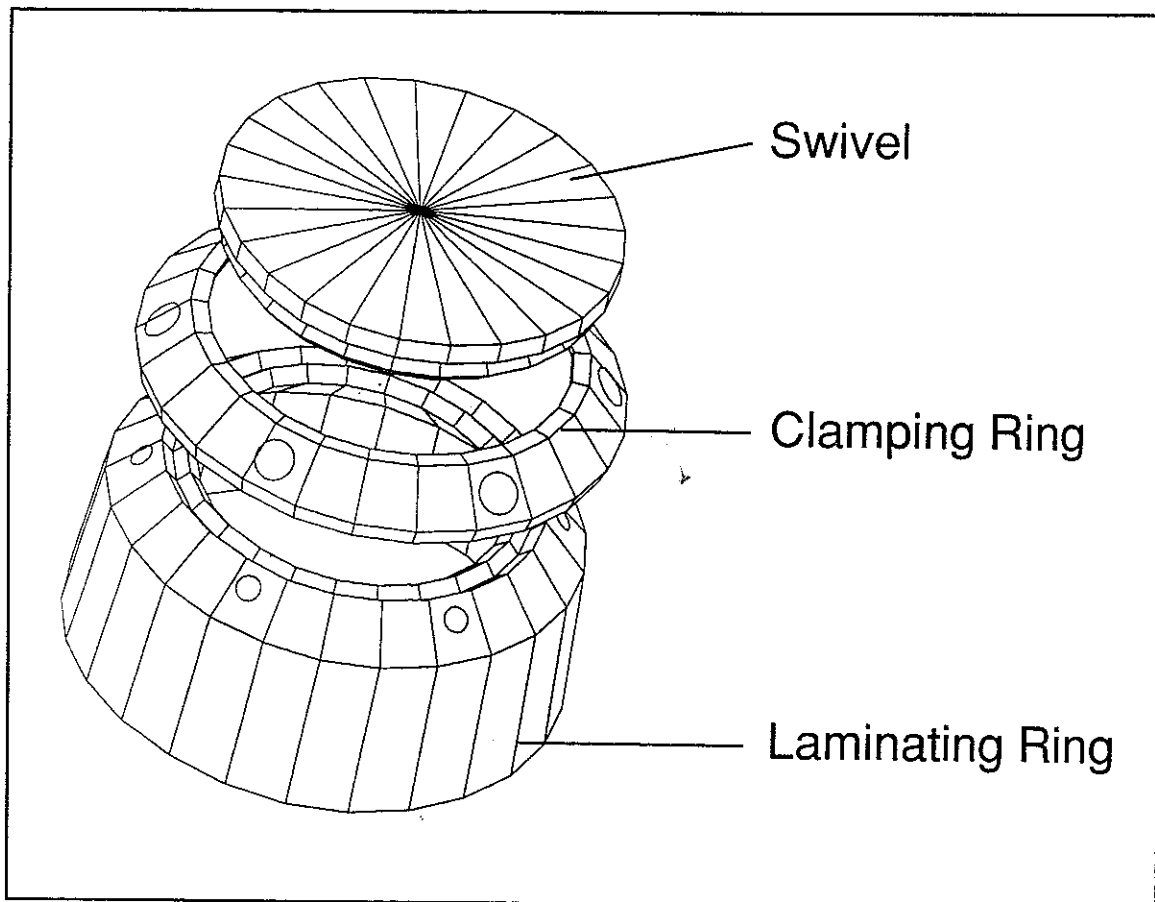
**Problem:** For wrist disarticulation and long BE amputations it is difficult to build in a wrist rotation unit without making the prosthesis very long.

**Solution:** The wrist unit looks like a laminating ring with the end made so that it can swivel.

The laminating ring portion is laminated into the outer socket.

The swivel plate is custom drilled depending on the hand to be used.

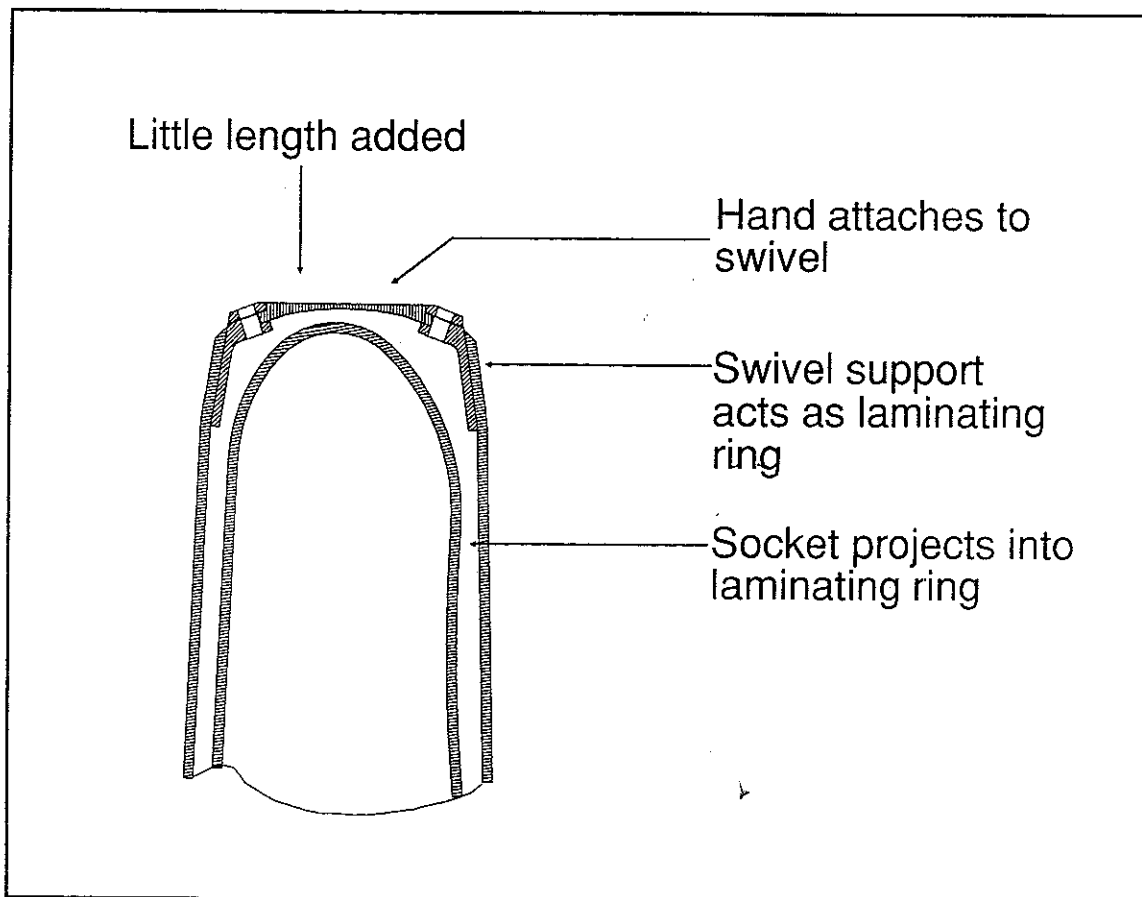
The clamping ring is attached to the laminating ring base of the wrist unit with screws which allow the friction between the clamping ring and the swivel to be adjusted.



### Wrist Rotation Unit continued ....

The unit adds very little extra length as the inner socket can project into the unit until it almost touches the back of the swivel plate.

The ones fitted to date (three units) have been custom made. With more experience there is likely a range of sizes (small, medium, large) which would give acceptable results.



**Fittings:** These wrists have been fitted in three pre-school or elementary school age children. There have been no problems from the field, and the children and their parents seem pleased with the results.

**Funding:** This project has been an internal project of the Institute of Biomedical Engineering, with patient funding from the War Amputations of Canada, CHAMPS Program.

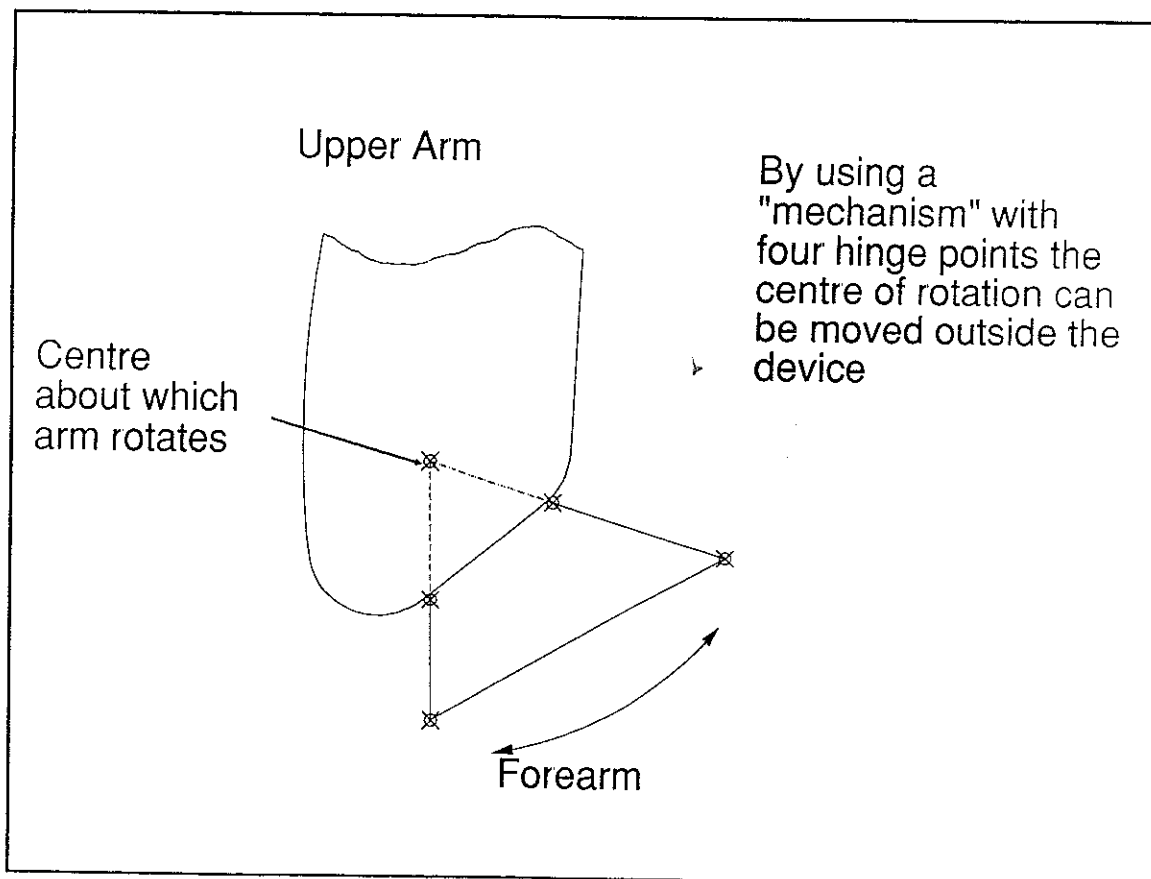
## CURRENT UNB PROJECTS

### Elbow for Elbow Disarticulation Amputations:

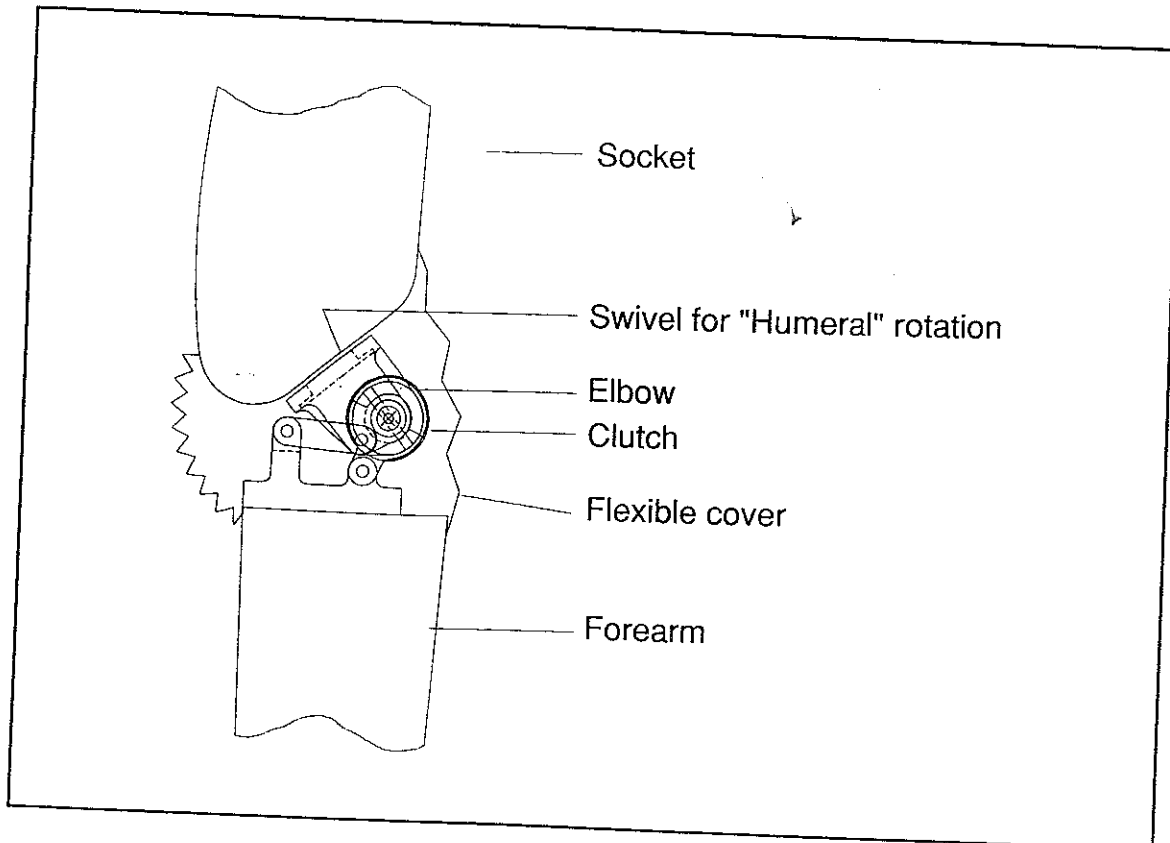
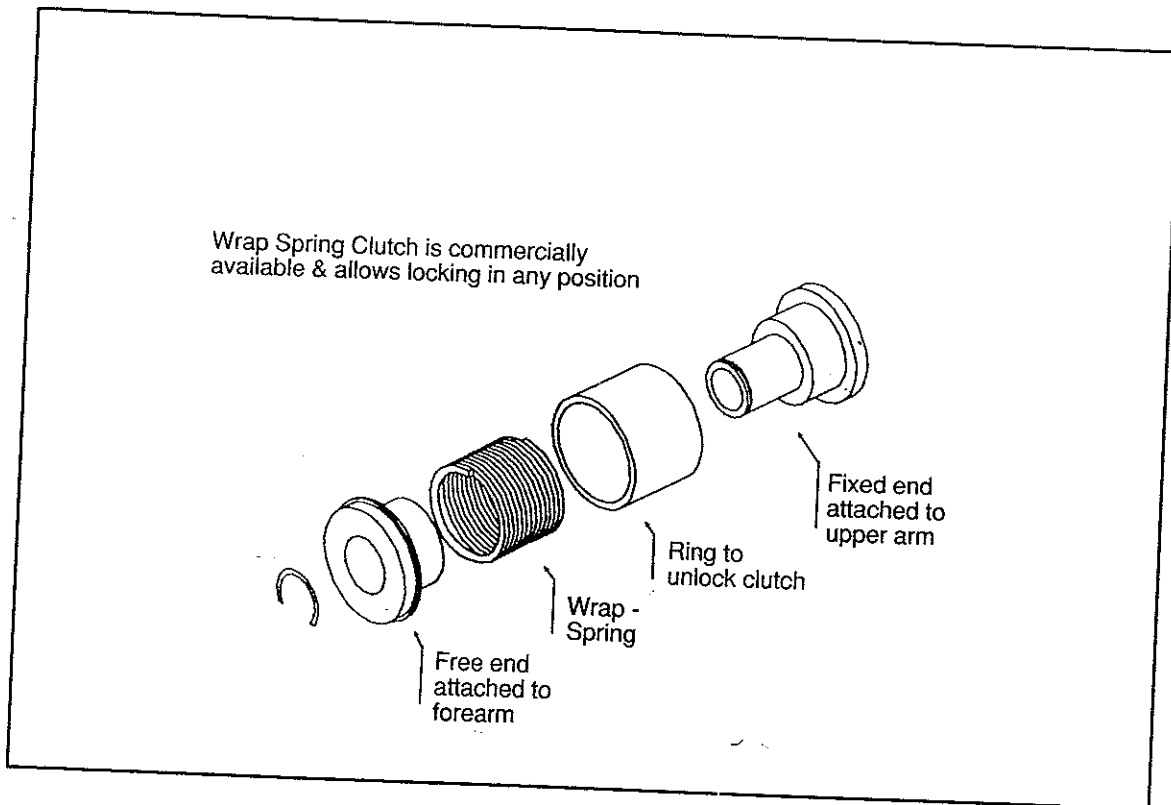
**Problem:** Elbow disarticulations pose a difficult fitting problem since the stump on the amputated side is approximately the same length as the upper arm on the sound side. Adding an elbow unit to the end of the stump makes for a disproportionately long upper arm, and outside hinges make the upper arm very wide.

**Solution:** By using a "mechanism" similar to those used in knee disarticulation prostheses one can move the centre of rotation of the forearm relative to the upper arm closer to its natural location.

The first objective has been to develop an elbow which uses this principle and which can be locked. The locking system in the current elbow is a "wrap spring clutch" which allows locking in an unlimited number of positions. Currently the elbow locks only to resist extension which doesn't seem to have caused too many problems.



Prosthetic Elbow continued ...

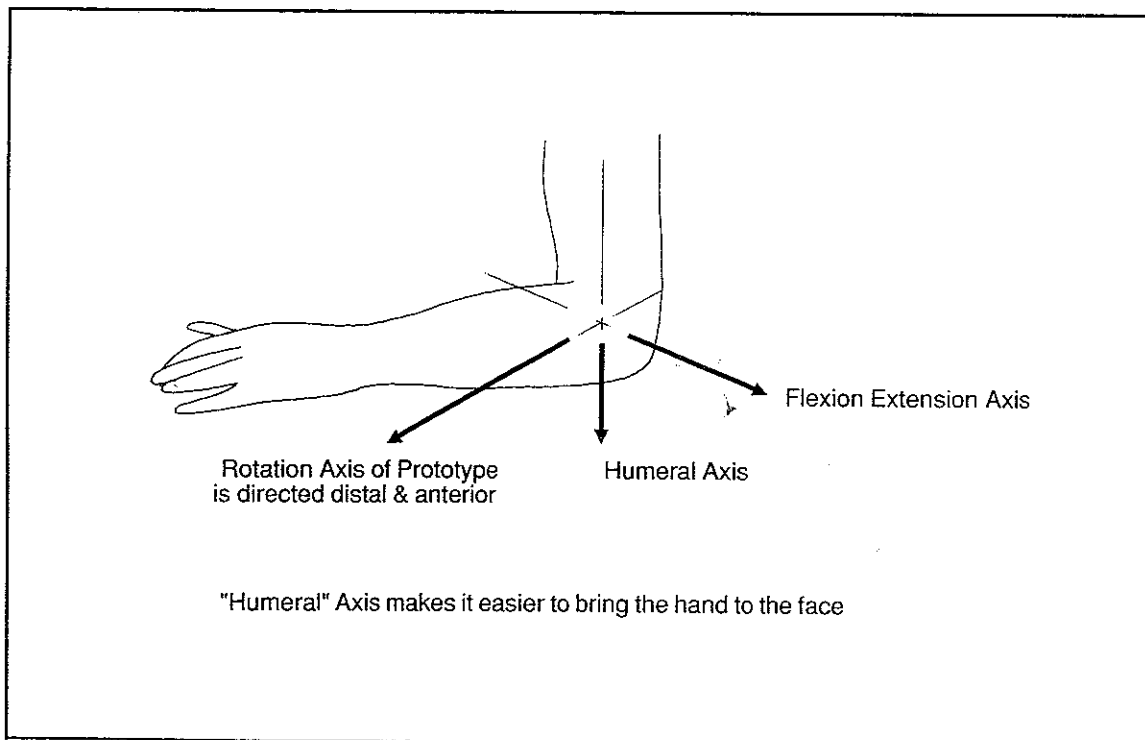


Prosthetic Elbow continued ...

**Solution:** The current elbow is positioned by swinging it into position. The unit is normally "locked" to resist extension. Pulling on a release cable allows the clutch to slip and the elbow to extend. The elbow can also be put into a true free swing mode in which the clutch is disabled. This is accomplished by a slightly longer pull on the release cable. The next pull toggles the lock back to its usual "locked" state.

A problem with the design has been that it is very sensitive and takes little force to operate. The youngster on whom it has been tried has as his ordinary prosthesis one with outside locking hinges which requires a substantial tug.

Another unique feature of the elbow is the orientation of the "humeral" axis. Rather than being aligned with the long axis of the humerus, the axis is directed anterior and distal at an angle of about 45 degrees. This proves to be very effective in that when the forearm is rotated on the humeral swivel, the plane of action of the elbow tips bringing the hand to midline and the mouth more easily than in a standard system. This feature is the one the test subject likes the best.



Prosthetic Elbow continued ...

**Status:** The elbow was in field trial for three months. The trial ended due to some problems with wear in the prototype and due to some problems with the myoelectric hand. Currently the elbow is being redesigned to take account of the things learned in the first fitting.

Our objective is to develop this mechanical elbow, a smaller friction unit which can be used in infants, and a powered version.

**Funding:** This project has been funded by the Medical Research Fund of New Brunswick, the Whitaker Foundation, The War Amputations of Canada CHAMPS program, NSERC, the Canadian Armed Forces and others.