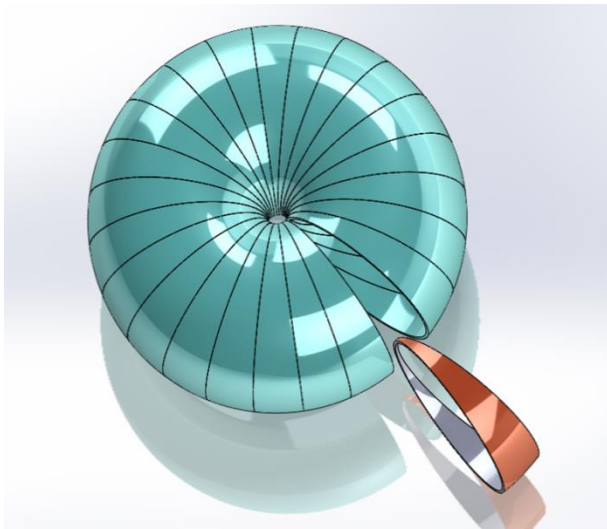
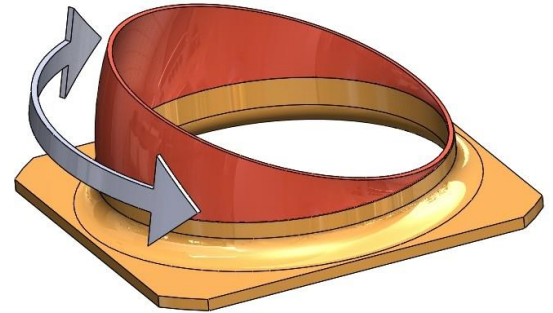


## The Novel REM Joint (Rotatable Envelope Modules)

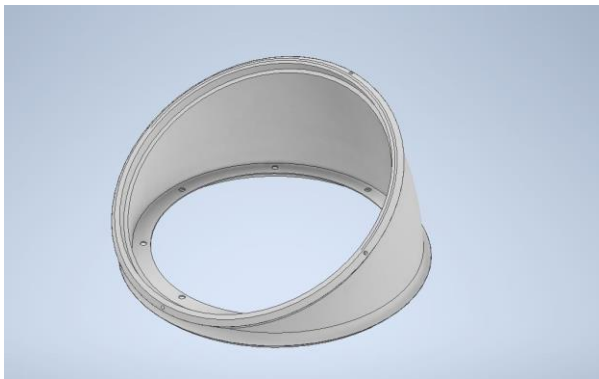
REM's represent a new style of engineered mechanical joint which bring benefits as well as unique and new possibilities and solutions for industry and manufacturing.

### What is REM

In its simplest form, REM's can be thought of as a hollow round wedge, simply a segment of a torus. When the REM is rotated, about a fixed base, it changes the orientation and angle of the exposed plane allowing for articulation

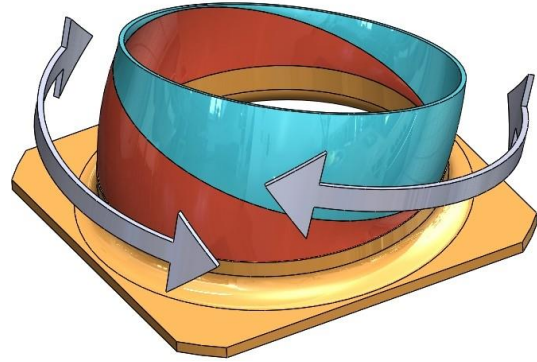


Envelope (elbow) is a segment of a torus



Envelope (elbow) fabricated

When 2 REMs are concatenated, it doubles the degrees of freedom rendered, as each module can be rotated in either direction, independent of the other REM.



REM two module assembly

### REM Benefits

- 1- The REM stable conduit is entirely novel in mechanical engineering;
- 2- No other joint provides a stable conduit.  
Wherever one has seen cables hanging outside a point of mechanical movement, in flimsy protective housings, giving proof to the historic need, to solve this long-standing forced workaround.  
Industrially, having no cables hanging, ready to be tangled, results in faster safety inspections, increased safety and decreased down-time!
- 3- REM superior accuracy comes from the drive point being at maximum radius;  
This significantly lowers the cost of motors and electronics.
- 4- Modular design allows faster assembly/disassembly, replacement, and scaling.  
The robotic arm design below, can have all the motors installed or removed within ten minutes!
- 5- REMs can be added to existing technology, with minimal modifications.  
Endoscope proposed modification can add 3 DOF to the current system.  
REM's can resolve engineering singularities, a concern of all current joints and robotics.
- 6- REMs can scale from large industrial applications, such as mining and directional drilling, down to surgical tools and even nanotechnology.
- 7- REMs can create, translate, and manage high torque through inherent leverage
  - hydraulics replaced by leverage.
  - significantly increased stroke length.
  - can also move in any direction (not just up and down).
- 8- REMs represent the next evolutionary step in wearable robotics.  
The wearable robotic arm design below, will demonstrate the ability to repeat actions recorded;  
This has industrial as well as medical applications, such as physiotherapy etc.

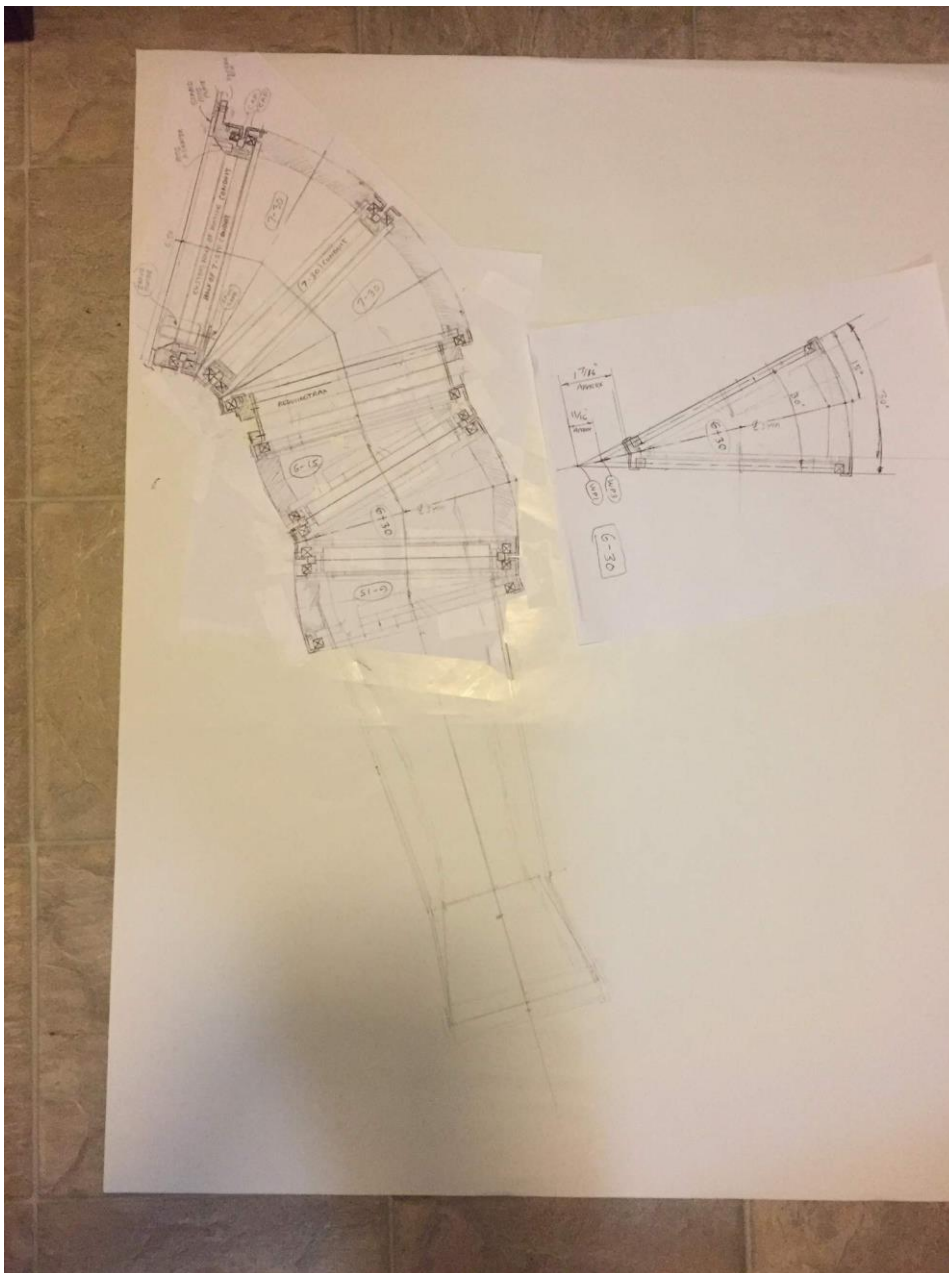
## Current

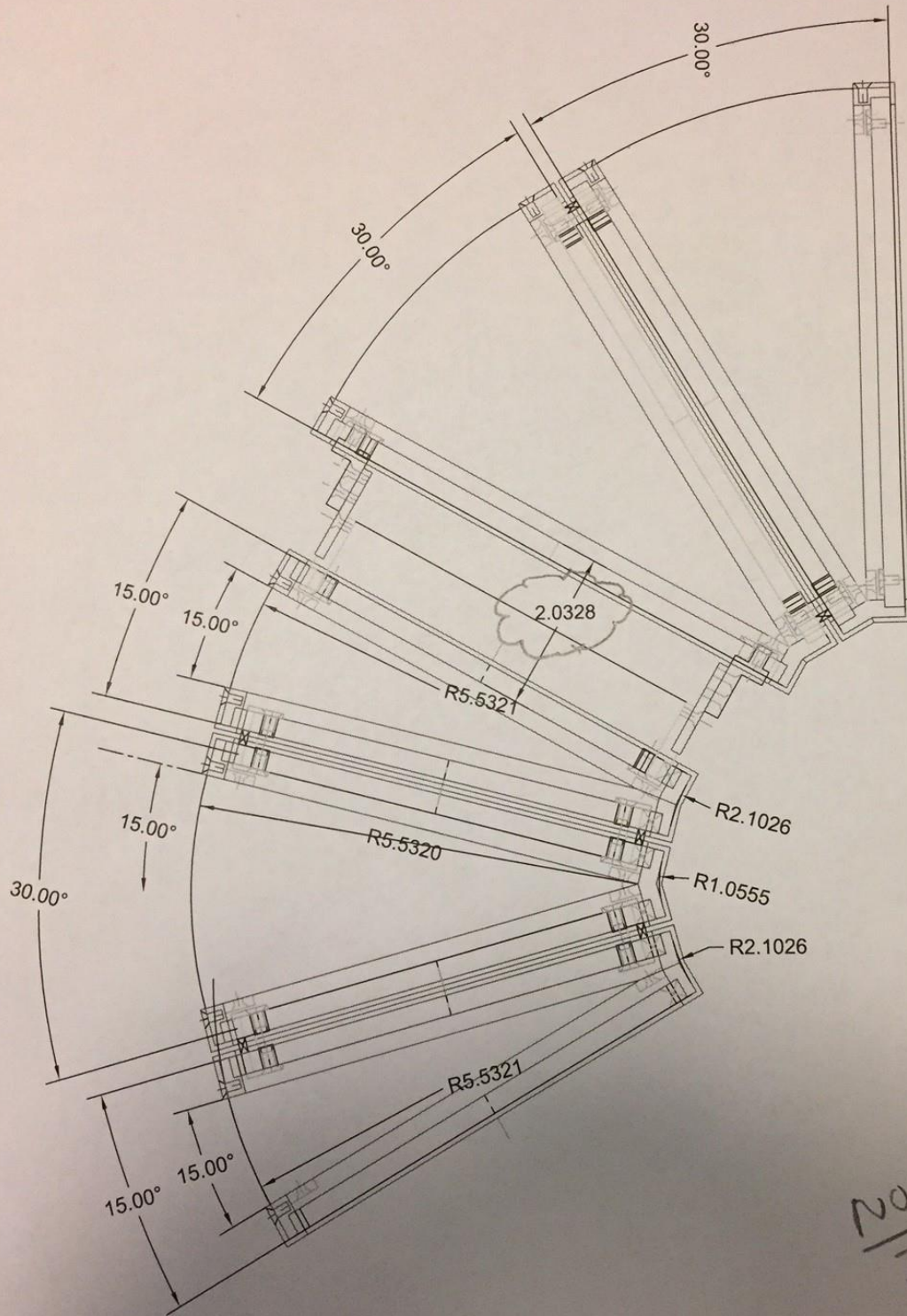
The following images and sketches are based on the working prototype, expanding the design to six REMs and an effector/gripper.

There are 5 simple wedge shaped REMS (2x30 shoulder, 1x30 & 2x15 elbow ); while the forearm section may look elongated and distorted, the forearm is the sixth module.

With the motors removed, one can:

- insert their arm into the system;
- turn on position sensors and electronic recording;
- take some actions, then stop recording;
- remove one's arm and install all motor assemblies within 10 minutes!
- Play back the recorded sequence and optimize.





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## **Market Breadth and possible Business Model**

REM technology benefits and flexibility has identified a number of immediate integration markets, as well as future development, specifically based on REM design. In short, the vast number of markets that will be affected by our patent suggests an "arm's length" approach, in the form of ML (master license) management, based on arbitrary market division.(eg: robotics, mining etc.)

Ideally, the ML approach would contract with industry leaders, within each defined sector, to manage their own sector, with respect to trade and royalties worldwide. Such relationships would have to have some periodic production guarantees, based on each individual sector and the nature of the agreements.

## **Potential Markets**

Initial Market Penetration ("low hanging fruit" example)

A prime candidate for REM market penetration is the robotics industry, specifically automated welding machines; as these systems' cables can carry high voltage or volatile gasses, which are a safety concern as:

- 1- ISO and other international, industrial safety standards will more easily be achieved, when the volatile systems are inherently protected;
- 2- Down time, due to tangled or interrupted lines, or simply tripping over them and personal injury, will just end!
- 3- Insurance will be lowered to reflect added safety;
- 4- REM modular design will shorten installation, replacement and upgrade time

As demonstrated in the video, REM technology can be added to a surgical endoscope, with minimal modification. And the additional articulation does not interfere with the existing plethora services passing through the REMs, such as fiber optics, laser, camera, suction, irrigation etc.

REM's Scalability presents revolutionary opportunities in:

- Robotics;
- Directional drilling
- Surgical tools
- Manufacturing engineering
- Mining (boring disks)
- Water cutting
- Shakers/separators
- Hydraulic replacement
- Wind power blade angle efficiencies
- and list goes on...