



TELESCOPIC TOWER WITH CONTINUOUS INTERLOCKING CONTACT

WILLIAMS, C. 1996. *Continental Drift*.

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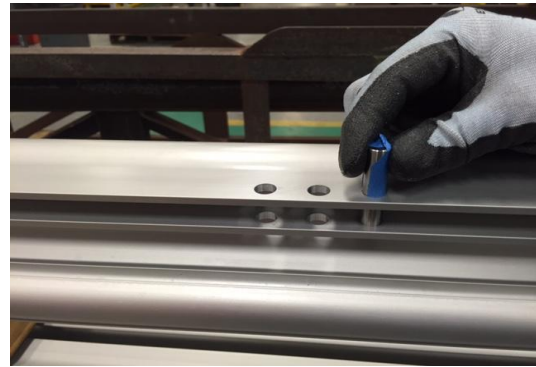
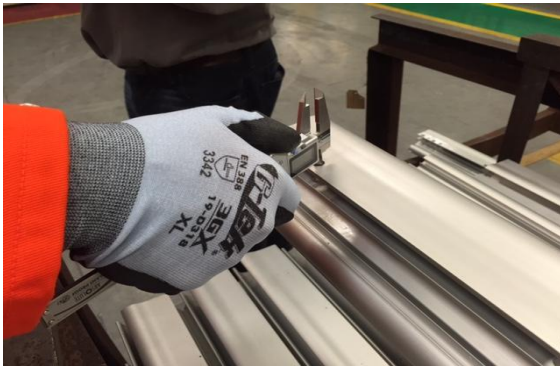
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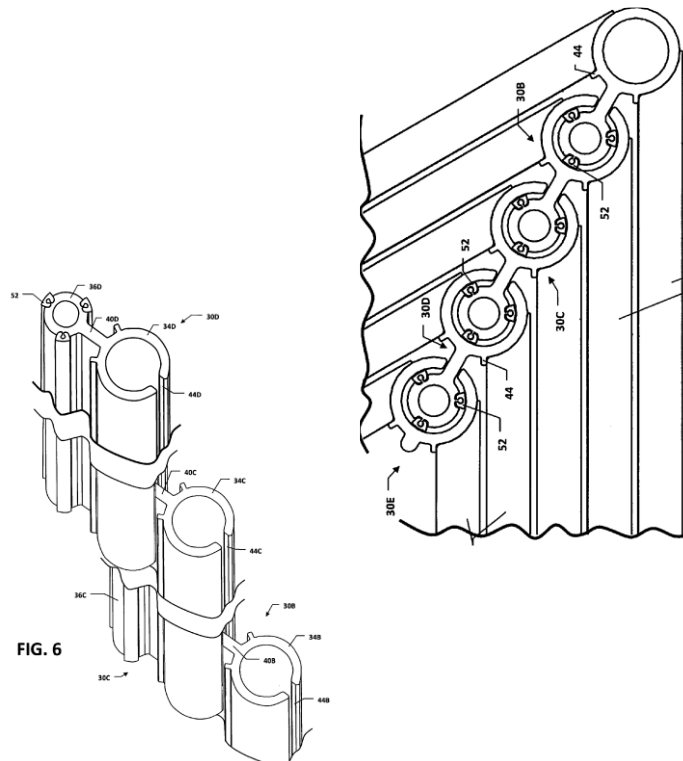
INTRODUCTION

Traditional telescopic, crank-up, or lattice towers, as they may be referred to in the industry, consist of several tower sections, varying in size to slide in and out of one another and achieve the maximum elevation. These sections are connected through a series of cables, pulleys, and a winch responsible for raising and lowering sections individually or simultaneously. The process that combines cables, pulleys and a winch is referred to as “rigging”. A shared problem in the telescopic, crank-up, and lattice tower industry arises from the spacing between the varying sized sections. This spacing or gap is typically measured as the distance between one leg of a section and the leg of the adjacent section. This is known as “play between sections.” The gap can be as small as 1/8 inch or as much as 1/4 inch. While “section play” is required to allow the sections to raise and lower, it allows lateral and/or angular motion that applies undesired torque and adversely affects the overall strength and stability of telescopic, crank-up, or lattice towers with two or more sections. The effect is amplified with every additional section. In windy conditions, the play between sections creates pressure points at several different locations along the tower legs, potentially weakening these areas and increasing the probability of failure.



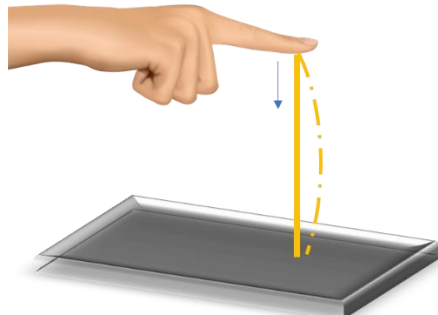
METHODOLOGY

US Patent 8826604 B2A – A telescoping tower includes a plurality of nested tower sections extendable in a telescoping direction, each of the plurality of nested tower sections having a plurality of legs that define respective heights of the plurality of nested tower sections in the telescoping direction, each of the plurality of legs slidably engaging at least one leg of at least one adjacent one of the plurality of nested tower sections along an overlap in the respective heights thereof. The interlocking system delivers industry firsts in strength and durability surpassing competing products in the market. The aluminum modular tower design implements a continuous contact system through the full extension of each section. This interlocking capability maintains structural integrity throughout deployment eliminating drift or potential for misalignment between sections.

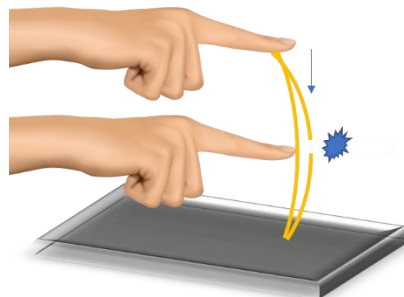


Some companies in the industry try to eliminate the play between sections by adding wheels, rollers, or other mechanical means to the top and bottom of all coaxially located inner sections. Unfortunately, this creates stress risers on the localized areas where the wheels or rollers are located. In addition, it reduces the lifespan of the legs, pulleys and even the tower legs by creating wear points on the leg surfaces. US Pat. No. 8,046,970 goes as far as to create a slide bar mechanism mounted to a 4-foot span of rungs and diagonals creating an interference fit. At the point where the slide bars meet, play between sections is eliminated by the slide bars interfering against one another. However, while this does indeed reduce play between the sections it axiomatically also causes premature failure of the rungs and diagonals by placing the interfered rungs and diagonals in out-of-plane bending also known as an eccentricity of the neutral axis of the beam. To express such a condition, conduct the following experiment.

Place a piece of spaghetti under your finger so it is standing vertically. Feel the resistance as it starts to bend.



Next, take a piece of spaghetti and prebend it. Notice how the force required to continue bending the piece is significantly reduced?



What does this mean?

The load carrying capacity of any beam along its' axis, is exponentially reduced when the beam's neutral axis is placed in an eccentric configuration. The critical buckling load has therefore been reduced leaving the impacted rungs and diagonals weaker.

KEY FINDINGS

By integrating low coefficient of friction slide rods in the legs, a continuous interlocking contact is formed between the coaxially located telescopic sections. This maintains the structural integrity of the lattice elements. This design concept, along with our riveting technology, yields the strongest aluminum tower in the market and the **ONLY** tower that offers 24 ft slide rods and continuous interlocking contact by every tower leg, on every tower section. This design virtually eliminates play between sections commonly found in the aforementioned telescopic tower designs.



To improve upon the patent, Axiom engineers changed the welded layout to a riveted design. Riveting provides an aluminum tower with the strongest joint. Aluminum alloys suffer from Heat Affected Zone (HAZ) degradation after welding. The HAZ can be defined as the area of the base material that is not fully melted but has had its microstructure and properties altered by welding. The thermal fluctuations cause a change from the weld interface to the termination of the sensitizing temperature in the base metal. The HAZ area can radiate out from the weld up to 2" depending on the environmental conditions, input voltage, and experience of the welder. **The loss in yield strength can be up to 40%.**

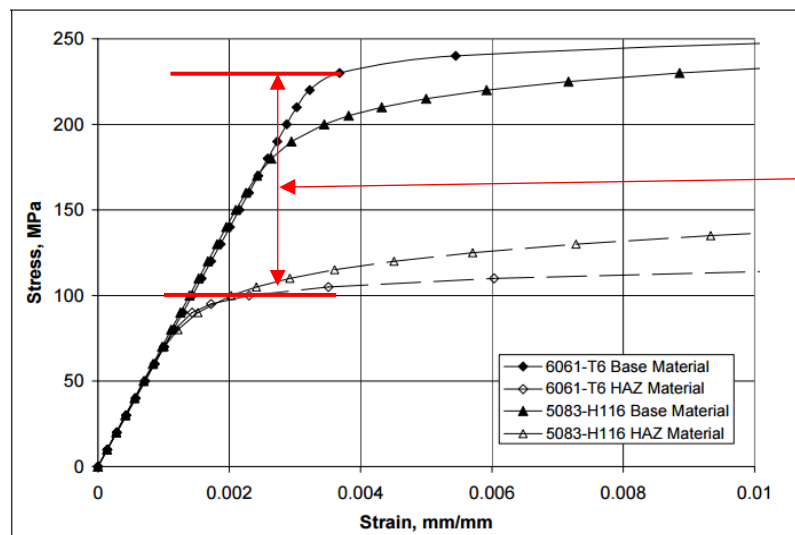


Figure 1 Comparison of Stress-strain curves in 6061 and 5083 materials

CONCLUSION

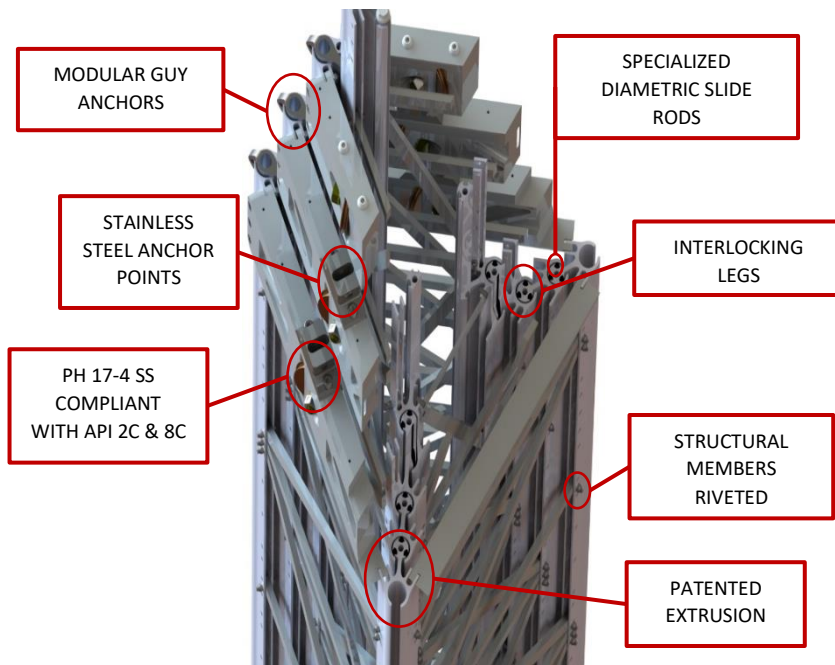


THE NEW GENERATION OF LATTICE-TELESCOPIC TOWERS

This design produces the strongest aluminum tower on the market. Our tower survived full scale structural testing without failure or plastic deformation, for 13 consecutive days unguied, under the following conditions:

- ⊗ Elevation (AGL) – 104 FT
- ⊗ Payload – 375 LBS
- ⊗ Payload Sail Area – 20 SQ FT
- ⊗ Sustained Wind Speed – 80 MPH

The new generation of telescopic aluminum towers is cutting a path with surgical precision through engineering and testing. Our Modular Platform Architecture (MPA™) provides a stable platform that can be configured and reconfigured for varying CONOPS (Concept of Operations).



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