

California Energy Commission
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California Energy Commission

DOCKETED

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Invitation to Participate: Portable Spa Efficiency

Rule Making Committee; Docket No. 12-AAER-2G

By E. Jess Tudor

Design Engineer - Six U.S. Patents

Two Patents Pending

Background:

After creating and patenting a safer spa cover lift device for folding spa covers fitted with dual hinges in 1998 I found the cover to be poorly designed. The dual hinge provides cover lifters a thin vinyl membrane for the folded cover to hang from while being stored, thus continually abrading and degrading the hinge.

After becoming more familiar with the destructive nature of hinge tearing lifters, I designed and developed an energy efficient single hinge spa cover and integrated removal system that was awarded a U.S. Patent in June of 2003. One aspect of that innovation was a more energy efficient closure; subsequent cover designs have further improved portable spa stand-by power efficiencies.

Test Results:

In 2007 I was asked by the NRDC to contact Gary Fernstrom of P.G. &E. with test results of the single hinge cover as the CEC was creating energy guidelines for portable spa efficiency. Mr. Fernstrom encouraged me to enter my single hinge cover in an upcoming test for P.G. & E. at Cal Poly University in mid 2008 that included many top manufacturers of portable spas in North America. The results were significant, my entry (V) was up to 75% more efficient than others tested and nearly two thirds of those entered failed to meet the maximum allowable for sale in California at that time. Entrants aware of the efficiency associated with my single hinge design preferred relaxing the CEC standard. Some spa covers now include a full length vinyl gusset hanging between the Expanded PolyStyrene foam cores with claims of R-12 insulating value. Evidence indicates vinyl is a petroleum based conductor with little insulating quality... published R-ratings mislead and don't include convection or radiant energy losses or prevalent atmospheric moisture.

Subsequent testing in ambient conditions in 2009/2010 for P.G. &E. revealed more dramatic results as convection and evaporation provided the presence of what I termed the, "Chimney effect" in which heat loss is greatly accelerated along the dual hinge when exposed to atmospheric conditions including moisture and convection.

During a dry, calm 60 degree ambient October sunset I recorded a temperature of 34° F on the upper surface of a foam/vinyl spa cover with the spa water at 100° F. This naturally occurring phenomenon is common in ambient conditions with a radiant heat source available. I was unable to replicate this super cooling event at our test facility as it was an insulated, refrigerated enclosure following P.G. &E. testing protocols as were the testing areas at Cal Poly in 2008. This evaporative super cooling (wind chill) might indicate the protocols for testing would be more informative outdoors where spas are generally located.

Conclusion:

After studying the ubiquitous dual hinged EPS foam/vinyl spa cover over an eleven year period I have concluded it offers a modest efficacy as an insulator for the portable spa when new. The open cell characteristic of EPS foam is not recommended for outdoor use. EPS covers increase energy use by storing moisture from radiant energy exposure eventually becoming too heavy for most to physically manage. At about 18 months of gradually degrading insulating value the dual hinged EPS foam cover is generally ready for replacement. Most spa owners delay replacing water permeated spa covers until they are dilapidated. Energy consumption increases while spa owners contend with access to just half of their spa, unable to lift the water heavy cover. This innocuous energy thief consumes 2 to 3 times the energy allowable for spas in California while inviting dangerous molds and noxious micro-organisms to proliferate in the cores.

Solutions:

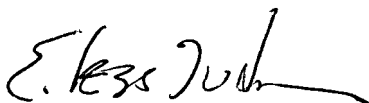
There are some ways to improve the efficiency and extend the insulating life of EPS foam covers; eliminate the gaping hinge, include a pliable perimeter seal, provide radiant barrier protection and allow the foam to off-gas. These simple changes might add just \$15 to the cost of materials including fees for patent protected technology. Our environmentally friendly, patents pending Airframe cover uses chambered air amid radiant barriers to insulate with no foam. This durable cover uses three U.S. Patents and is sustainable, recyclable and repairable. It supports a gas permeable outdoor fabric and with care might outlast the spa it protects. We offer license agreements that include a modest 5% royalty for our, "Green" technology to those interested in bringing manufacturing back to America.

Observations:

Competition has driven larger spa cover suppliers to manufacture in Mexico with cheaper labor, materials and fewer environmental constraints. Spa owners misled by R-value claims purchase EPS covers on the internet for \$269 -\$299 including shipping only to end up costing them \$750 -\$1060 a year for energy on standby power alone in California. Water saturated EPS foam covers end up in America for 500 years when carelessly discarded in our environment and 2000 years when stored in landfills designed to protect aquifers.

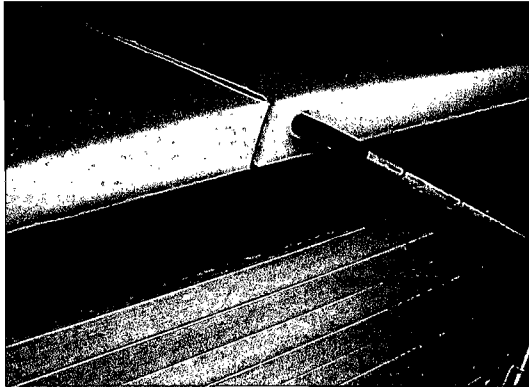
Sustainability might be a consideration by the CEC as the average EPS spa cover represents 3520 Styrofoam cups and it is estimated some 11,000+ moldy covers are discarded every month in California, equivalent to 465 million cups a year.

The photo page accompanying this document is for references...we thank you for the opportunity to be involved in the rule making process to include more energy efficient products.

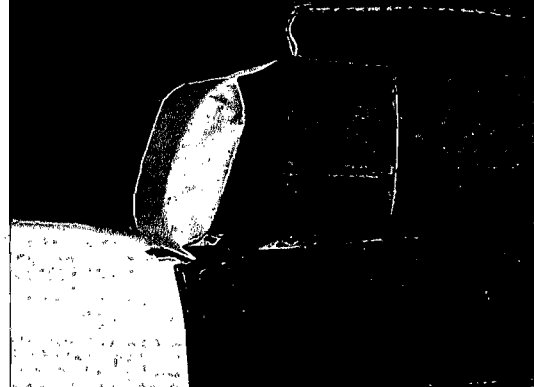


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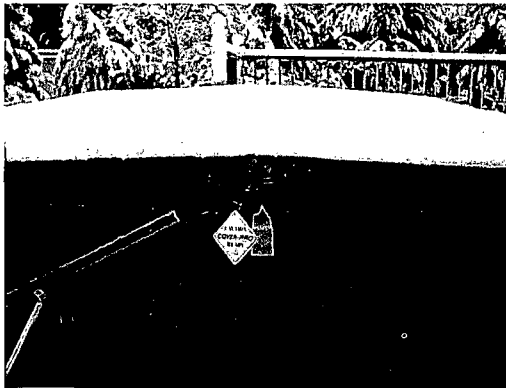
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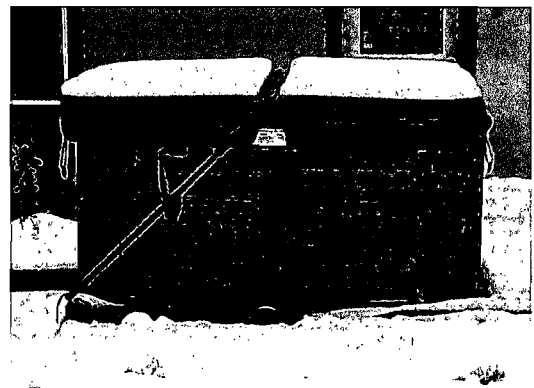
Single hinge, "Angle of Compression" seal



Dual hinged, "Wedgie" obviates heat loss.

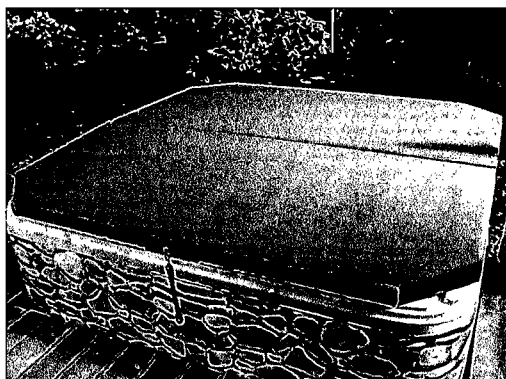


Single hinge and snow fall from night before.

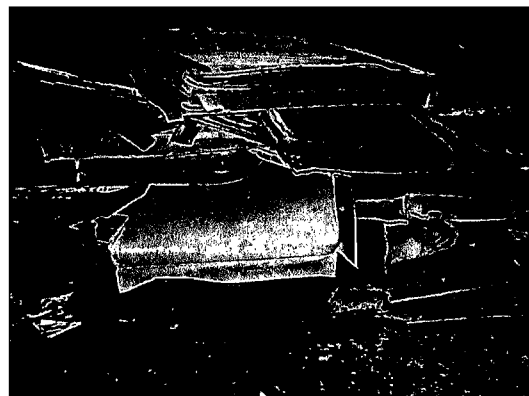


"Chimney effect" from dual hinged cover.

(These morning photos were taken of two different spas from the same evening's snowfall)



Airframe; sustainable breathable outdoor fabric.



1 month's trash from 1 spa dealer = 28 covers

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