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Technology that moves the world

TINY ENGINES FOR MICROSATS

An innovative, 3-D printed ion drive can power a satellite small enough to fit in a breadbox.

Thomas Chase (left) and Thomas Kuehn tinker with the mechanism of a Flute and Violin Solo Piano (Paul Lösche, Leipzig, Germany, 1925). In a traditional pianola (illustrated below), air drawn though holes in the paper roll opens a valve, which applies a vacuum to collapse a pneumatic striker bellows.

Photo: Paul Udstrand, Illustration: North West Player Piano Assoc.

PLAYER PIANO PLAYERS

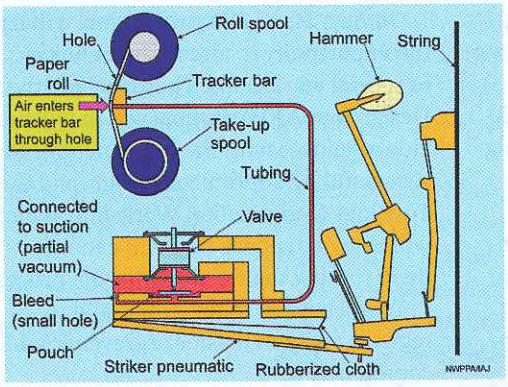
When Thomas Chase was seven, he put a coin into a player piano at a penny arcade. "This thing started playing music all on its own. I was instantly addicted," he said. His affinity for mechanical music stuck, evolving into an academic interest in mechanical design. But he never forgot his early fascination with century-old music boxes.

Chase is one of two mechanical engineering professors at the University of Minnesota, both ASME Fellows, who are helping preserve the history and artifacts of the mechanical music era, when machines played popular acoustic instruments. "They were developed when mechanics ruled—before vacuum tubes and electronic amplification," said Thomas Kuehn, the other professor.

Between 1910 and 1925, 85 percent of all new pianos included self-playing mechanisms. Player pianos, often called pianolas, were common in many households and coveted by most.

In a traditional pianola, a perforated paper roll travels over a tracker bar with 65 or more holes, each one connected to a pneumatic valve corresponding to a specific piano key. Inside the valves is a vacuum created when the player alternately presses dual foot treadles. When air enters through a perforation, a sensing diaphragm opens a valve, which enables the vacuum to collapse a small pneumatic bellows to actuate that key. Add a vacuum-powered motor and governor to drive the paper roll, and you have a complicated machine.

Fiercely competitive during their heyday, pianola manufacturers added features. Electrical power replaced foot pedals. Snare drums and tambourines kept rhythm. Organ pipes provided band and orchestra sounds, and advanced models with all these features—orchestrions—sounded like full bands or orchestras.



A major technological advance was the reproducing piano, which reproduced a piece exactly as an accomplished pianist had played it. A virtuoso pianist would play a special marking piano that inked a paper roll from which perforated rolls were later created. These perforated rolls had extra tracks to preserve the volume, tempo, and pedal action of the pianist.

One of Kuehn's favorite instruments, his rare Mason and Hamlin piano, came equipped with an Ampico B reproducing player, which, according to Kuehn, might be the best traditional vacuum system ever built.

Chase's collection includes a Link AX and a Seeburg E—both high-end orchestrions with special effects like a xylophone, snare drum, and tambourine. Housed in plush oak cabinets with elegant stained glass faces, these coin-operated beauties inhabited 1920s-era cafés and restaurants.

But by 1930 radios and phonographs with amplifiers and loudspeakers, which could reproduce the human voice, were replacing player pianos of all types.

Although many player pianos are spectacular examples of craftsmanship, technology, and novelty, in some ways an ordinary foot-pump model is the most fun, Chase said. "Pump harder and it gets louder, pump softer and it quiets down. You're part of it." ME

JAMES G. SKAKOON is a retired mechanical design engineer and a frequent contributor.