Randy Stott, Managing Editor

Chasing the Dream

Over the past several weeks, I've had quite an interesting back-and-forth e-mail conversation with John Pellegrino, an engineer, inventor and dreamer whose letter appears on page 8.

For well over a decade, Pellegrino has been working on his design for a device that has eluded some of the brightest minds in engineering—a positively engaged, continuously variable transmission (CVT). It's a concept with great potential.

The CVT has intrigued automobile manufacturers since the beginning. In fact, Karl Benz's first patent for an automobile, in 1886, included a friction-based belt CVT. Over the years, a number of attempts have been made, and some have even made it into production. Notable examples include the British Clyno gearbox, built in the 1920s; and the DAF 600 with its Variomatic transmission, produced from 1959-1964.

Beginning in the 1980s, interest in automobile CVTs really took off, and today, with continuous pressure on automakers to increase fuel efficiency, there are literally hundreds of cars offered with different types of CVT transmissions, including belt-driven, chain-driven and toroidal roller based models.

Of course, CVTs have also been fraught with problems. There have been lawsuits, recalls, and a history of repairs and trouble. Not to mention the fact that auto enthusiasts absolutely loathe them. A car without actual gears in the transmission is just not as much fun to drive. GM and Ford have abandoned the concept (at least for now).

Nevertheless, *Automotive News* predicts that CVTs will grow from seven percent of the market in 2010 to 16 percent by 2015. And some automakers are clearly all-in. Nissan, for example, uses CVTs on all of its current front-wheel-drive models.

Photos Benz 1886 reproduction car (above), Modern Audi CVT (background)

What we really need is a better CVT, Pellegrino says. All of the current models and past attempts suffer from one or more deficiencies. In 1995, Pellegrino published an article that included his requirements for a viable automobile transmission:

- No reliance on rubber-like elements such as belts and/or rollers. These devices have severe power limitations and are subject to rapid wear.
- No reliance on power transfer through high-force, metal-to-metal traction (friction). These devices have severe wear and grooving problems and are difficult to shift.
- No reliance on one-way clutches or ratchets. These devices have power limitations and are prone to high wear rates.
- No reliance on oscillating mechanical elements, which can create vibration and low efficiency.
- No reliance on additional subsystems such as pneumatic, hydraulic or electrical components.
- The ability to execute rapid ratio shifts without having to overcome high friction or other forces.
- The ability to deliver a smooth, nonpulsating, rotational output.
- The ability to operate in a direct-drive manner in both the forward and reverse mode with no free-wheeling in either direction at any time.
- Reliance on well-established mechanical elements throughout.
- Manufacturability using current production techniques.
- Good adaptability to industrial and automotive applications.
- Smooth, quiet operation at a high level of mechanical efficiency.

So far, Pellegrino says, none of the previous CVTs have met all those requirements. But he still thinks it's possible to build a better mousetrap. Do you? **PTE**