


The Cornay CV Joint

The full-race half-shaft from Team MacPherson's Trophy Truck, featuring 50-degree Cornay CV joints.

Why Didn't We Think of This?

by **DAVID KENNEDY**
PHOTOGRAPHY: COURTESY OF DRIVE TECHNOLOGIES

LAST MONTH WE TEASED YOU WITH A PHOTO OF THE Cornay CV joint and promised you the full story in this issue. Since SEMA we've been in contact with Paul Cornay, the inventor of the joint, and found that his technology has been around for a few years now but has not yet been available to the off-road consumer. Here we'll delve into the new joint a little further and share what we've learned. Hopefully by the time you read this we'll have gotten a chance to experience the new technology firsthand as we expect production to ramp up in the near future. Stayed tuned for more information. 

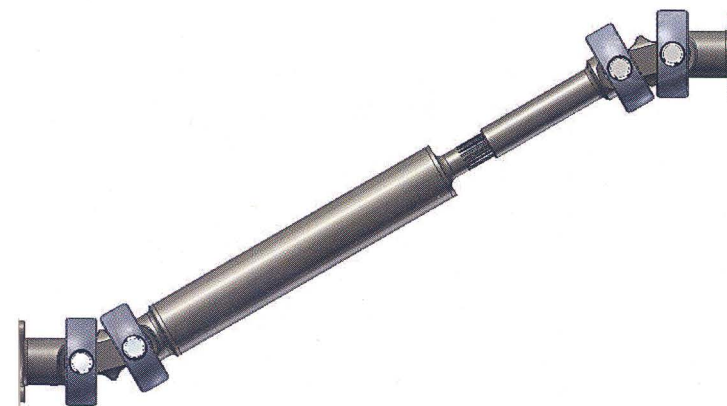


How It Works

Think of the Cornay joint as a cardan-type universal joint turned inside out. But instead of relying on a "+" shape inside the two yokes to transmit torque, the Cornay joint moves the yokes closer to the centerline of the joint and transfers torque through the outer rings. The Cornay design still uses roller bearing and trunnions, but reorienting them in this manner has some significant advantages. When paired to form a Cornay CV joint, it is possible to transfer torque at up to 90 degrees with true constant velocity. This photo shows a 50-degree Cornay CV designed for steering applications.

Configurations

Up to this point Cornay joints have been designed and manufactured on a custom-order basis to meet the requirements of particular applications. As we showed you last month, the Cornay joint can be configured to replace the common double-cardan CV joint. Since then, the Cornay joint has undergone testing in various applications, including short-wheelbase, low-g geared 4x4s. The driveshaft you see here uses a 30-degree Cornay CV at one end and a cardan-style joint at the other that could make it a direct bolt-on for existing applications. However, the Cornay joint is not limited to just driveshafts and has also been used in halfshafts and steering joints and to solve cooling-fan drive problems on military vehicles.



Maximum Angles

The Cornay joint was designed out of necessity to run an industrial centrifuge that required a universal joint to run smoothly at 3,000 rpm, at a 45-degree angle, and under a 400 lb-ft load. For the off-road market we expect to see Cornay-joint-equipped driveshafts available soon to handle in the neighborhood of 30 degrees and much more torque. We have already witnessed the successful use of a 50-degree Cornay-joint-equipped halfshaft in the front of Team MacPherson's four-wheel-drive Trophy Truck. You can check out an awesome video of it at www.drivetechnologies.com.

Advantages of the Cornay CV

- True constant velocity at all angles
- Higher torque loads
- Higher rpm potential due to lower polar mass
- Angles up to 90 degrees
- 65 percent less vibration
- No boot required
- Smaller package size than equivalent double-cardan joint.

SOURCES

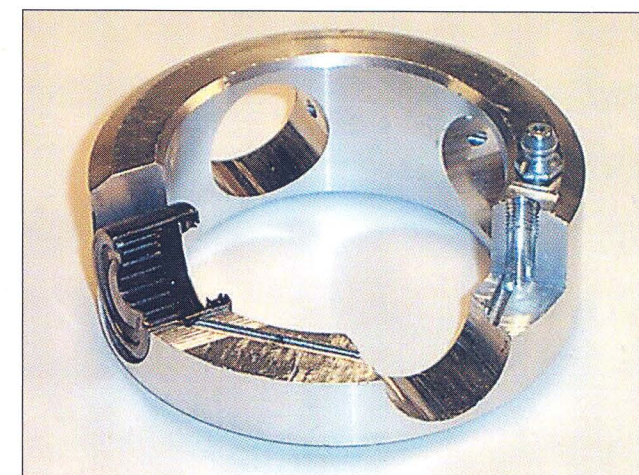
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Superior Lubrication

The Cornay joint has advantages in lubrication over common greaseable universal joints. Rather than relying on the purge system found in cardan-style joints that must push old grease out through the bearing seals (only assuring that the grease gets to the bearing with the weakest seal), the patented Cornay system has a grease inlet and outlet port to force lubrication through all four bearings. This not only assures 100-percent lubrication, but it also permits the use of better seals at the bearings to keep grime from getting in. Another advantage of the rings is that they act as efficient heat sinks to dissipate heat for extended roller bearing life.

Universally Misunderstood Definitions

In order to help you understand how significant the new Cornay design is, we'll define the common types of universal joint design. There's too much confusion and misuse of the names people use to describe joints, so we'll clear this up before we go any further.

U-joint: Abbreviation for universal joint. Any joint that connects two shafts rotating in separate or varying planes. The name does not designate a particular design.

CV-joint: Any joint that provides a constant velocity regardless of the operating angle of the joint. This can include Tracta, Rzeppa, ball type, tri-

pod, or Cornay joints. A constant-velocity joint eliminates the impact hammer effect that occurs on driveline parts resulting from the double acceleration that cardan-style joints can cause.

Cardan joint: Most common universal joint in the off-road world. Transmits torque through two yokes connected

by a cross shape. Also known as a Hooke's joint, although it's most commonly referred to as a U-joint. In 1903 Clarence Spicer patented the improved cardan joint we all use today that has independent roller bearings at each end of the cross.

Double-cardan joint: A back-to-back arrangement of two

cardan universal joints. Though better than a single cardan, the double-cardan joint only provides "near" constant velocity.

Rzeppa joint: A type of CV joint that uses six balls and an inner and outer race with an intermediate cage to provide constant velocity transfer regardless of the joint

angle. The joint works like a bevel gear with the balls bisecting the joint angle and functioning as the teeth to transmit torque.

Ball-type joint: Improvement on the Rzeppa joint by Bernard Stuber in 1933 that positioned the six-ball cage eccentrically with respect to the center point of the joint,

enabling the joint to function reliably under all conditions; also known as a Birfield joint.

Tracta joint: Consisting of two balls linked by keys and slots. Each ball is connected to its respective shaft by a slotted fork.

Bendix joint: Each axleshaft has a cup on the end that holds

five balls between the two shafts. Four are on the outside in contact with the cups, and the fifth is pegged in the center to hold the others in place. The cups are shaped so the four balls are in contact with both cups at all times. Rotation of one axleshaft transfers force through the balls to the other axleshaft.