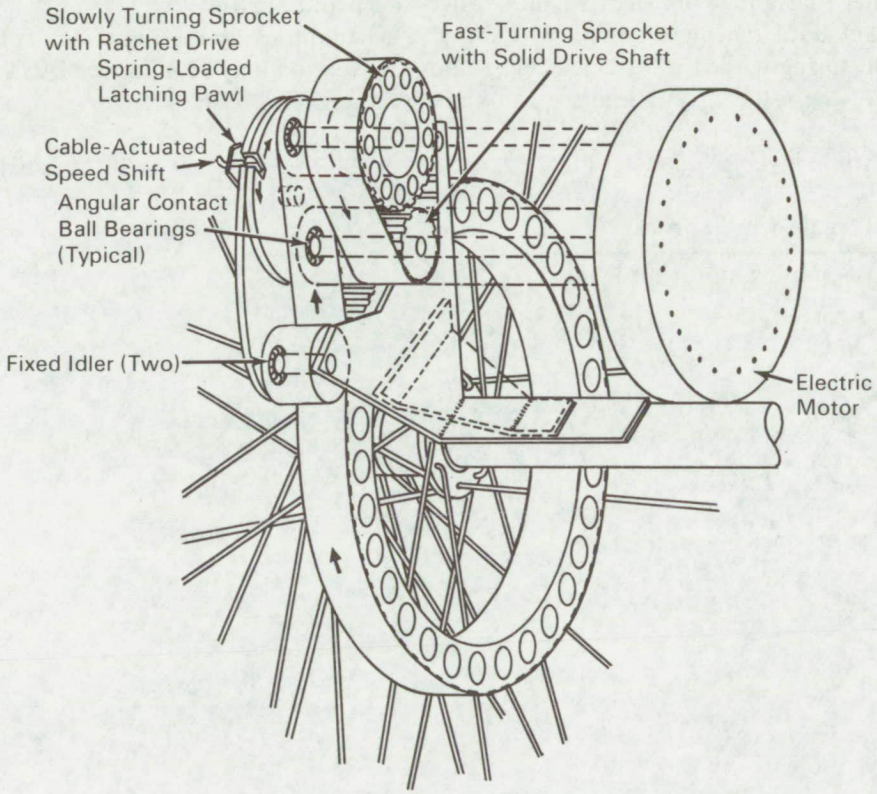
September 1970

Brief 70-10193

NASA TECH BRIEF

Two-Speed Wheel-Drive System Without Lubrication



The problem:

To devise a system for conversion of motor power to drive of individual wheels, as for drive of a vehicle's wheels by electric motors; the system should provide different speed ratios. Available systems use gears, shift mechanisms, and clutches and operate within lubricating baths; because no more than two teeth are engaged at a time, the loading on teeth is heavy.

The solution:

A novel system, based on sprockets and toothed belts, that provides two speeds (high and low) in forward drive and (with reversal of the motor) one speed (high) in reverse. It is relatively cheaply produced and maintained, light in weight, reliable, and long-lived without lubrication. At least four sprocket teeth are engaged at any moment.

(continued overleaf)

How it's done:

Two toothed belts and four sprockets transfer the rotation of the motor's shaft, reduce its speed, and drive the main driven wheel. The smaller sprockets are mounted on a rotatable plate, on a common center line. When its latching pawl is released, this plate can be rotated 180°, the latch engages the opposite slot, and the belt driving the main wheel engages the opposite sprocket, which is rotating at a different speed.

The alternate duty cycle is in effect low gear and high gear and requires no external power for operation. When the plate is rotated through only 90°, both slowly turning and fast-turning sprockets engage the main driving belt simultaneously; this phase of operation requires that the slower sprocket be driven through a ratchet that allows its shaft to turn faster than the sprocket until the plate completes its 180° rotation and the spring-loaded pawl again locks into place. Because of the ratchet, reverse drive can be in high gear only.

The high-gear ratio is (D is "diameter of")

$$\frac{\text{D main-wheel sprocket}}{\text{D fast-running motor sprocket}}$$

The low-gear ratio is

$$\frac{\text{D slowly turning sprocket with ratchet drive}}{\text{D fast-turning motor sprocket}} \times \frac{\text{D main-wheel sprocket}}{\text{D fast-turning motor sprocket}}$$

Note:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B70-10193

Patent status:

Inquiries about rights for commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: J. L. Burch
Marshall Space Flight Center
(MFS-20645)