

Linear Motor Transports Pallets in Automated Assembly System

Because of their ability to achieve fast speeds and high accuracy, linear motors have been used for years in semiconductor wafer handling and processing equipment. Now, the technology has finally found its way into automated assembly equipment.

MagneMotion Inc. (Acton, MA) has developed a high-speed linear synchronous motor

for transporting pallets in a multistation, asynchronous automated assembly system. Called the QuickStick System, the motor can be installed in new machines or retrofit into existing ones as a replacement for belts or chains.

The motor is 90 millimeters wide, 90 millimeters tall and 1 meter long. It is mounted between the rails of a standard assembly conveyor. To facilitate installation, it has standard hardware mounting schemes and simple electrical integration

features. The back of the motor is a standard T-slot extrusion. With a mounting bracket that spans the rails, the motor can be installed in minutes without special tools.

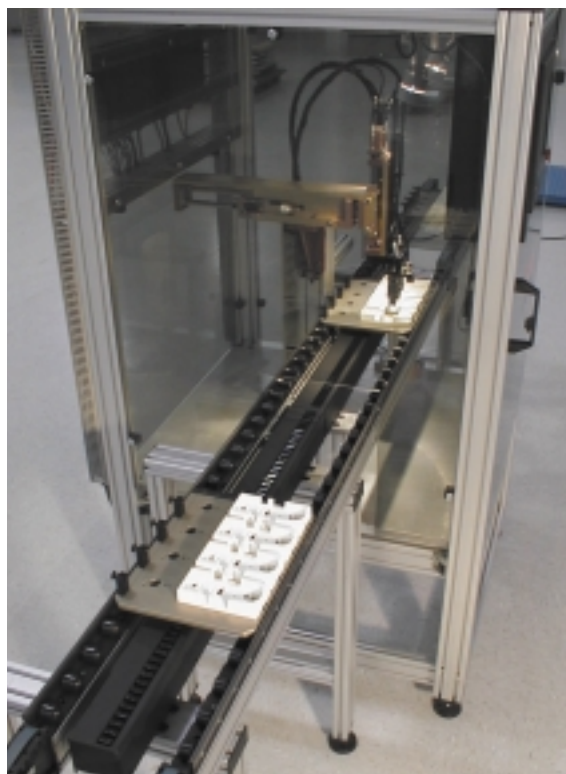
The motor module contains the motor starters as well as the pallet position sensing and motor control electronics. An array of magnets is mounted underneath the pallet, flush with the surface, to interface with the motor primary.

The array contains a thin ferromagnetic metal strip populated with neodymium-iron-boron permanent magnets. The currents in the motor primary winding react with the magnetic field on the pallet to create a propulsive force that can be accurately controlled. The magnetic field is small and drops off rapidly over a short distance, so no magnetic fields affect the pallet payload.

Cables, connectors and electronics enclosures contribute cost, complexity and potential failure mechanisms to a motion control system. They also take up valuable space. The QuickStick System alleviates these concerns by integrating the motor controllers into the motor housing. There is no separate electronics box and associated cabling. The circuit boards that commutate and control motor excitation are compact and mounted directly to the motor block, eliminating internal wiring and cable terminations. A single cable with an IP-67-rated, D-subminiature plug-and-socket connector handles both power and communication signals between the system power supply and the host control system.

A unique feature of the QuickStick System is its ability to independently control the rapid movement of multiple pallets with a single motor. In a conventionally configured linear synchronous motor, only one motor secondary (the moving frame or pallet) is permitted per motor module. This means that a motor can handle only one pallet at a time. In contrast, the QuickStick motor allows a pallet in the queue to begin moving into a process station at the same time that the preceding pallet is leaving the station.

For a synchronous motor to perform its motion control function, it must know the precise location of the pallet at all times. The QuickStick's position sensing technique per-

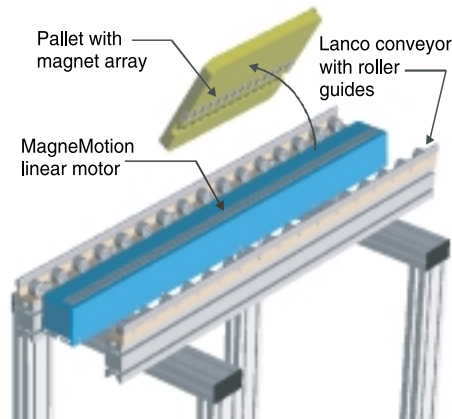


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mits high-speed, controlled movement of the pallets with a small distance between them. The motor positions pallets with a repeatability of 0.05 millimeter at process stations and 0.5 millimeter in conveyance areas.

The system can hold pallets in position with enough stiffness that some assembly operations, such as screw-driving or gasket application, can be performed under active motor control, without engaging a hard stop or shot pin. This can save valuable seconds in total cycle time. Operations that create high lateral forces on the pallet still require mechanical constraint to maintain submillimeter pallet positioning.

QuickStick linear motors can be arranged end-to-end for transporting pallets over any distance. The motors pass pallets between successive units without hesitation. The motors can also



The motor module contains the motor stator as well as the pallet position sensing and motor control electronics. An array of magnets is mounted underneath the pallet, flush with the surface, to interface with the motor primary.

exchange pallets with belt or chain conveyors. This lets machine builders create hybrid systems, with conventional conveyors for sections that do not require high-speed operation and linear

motors for sections that do.

Another feature of the QuickStick System is bidirectional travel. The motors can propel pallets with equal speed and acceleration in either direction. This opens up new possibilities for assembly systems. For example, a pallet can back-up to repeat an operation on a workpiece, rather than travel all the way around the circuit or rejecting the piece for a missed operation.

Lanco Assembly Systems (Westbrook, ME) is the first system integrator to include the QuickStick linear motors in its assembly machines.

For more information on linear motors, call MagneMotion at 978-461-5090, visit www.magnemotion.com, or **Reply 20**. For more information on high-speed automated assembly systems, call Lanco at 207-773-2060, visit www.lanco.net or **Reply 21**.

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