CLAIMS

1. An injection molding apparatus, comprising:

a manifold defining a resin channel for conveying liquid resin from an injection molding machine toward a mold cavity;

a nozzle for conveying liquid resin from the resin channel to the mold cavity;

a valve pin configured for linear movement along a longitudinal axis of the nozzle to control flow of liquid resin through the nozzle;

an electric actuator having a body containing an electric motor and a linear drive shaft with a bore,

wherein both the electric motor and the linear drive shaft are contained within the body of the electric actuator,

wherein the valve pin is directly or indirectly coupled to the drive shaft within the bore, such that linear movement of the drive shaft produces co-linear movement of the valve pin,

wherein the electric actuator body has a top opening and the bore extends through the length of the drive shaft to allow manual adjustment of the valve pin position,

wherein substantially an entire length of the bore extending through the drive shaft is internally threaded and the valve pin is directly or indirectly coupled to the drive shaft via an externally threaded valve pin nut threadingly engaging the internally threaded bore, and

wherein the valve pin nut has a tool-head engagement structure for manual positioning of the valve pin and valve pin nut with respect to the drive shaft; and

an externally threaded lock nut threadingly engaging the internally threaded bore and disposed adjacent a side of the valve pin nut opposite the valve pin.

2. The apparatus of claim 1, wherein the electric actuator is mounted on a minimum of one support attached to and in direct contact with the manifold.

3. The apparatus of claim 1, wherein the electric actuator body includes a channel for circulating a coolant.

4. The apparatus of claim 3, wherein the support is comprised of stainless steel.

5. The apparatus of claim 3, wherein the support is comprised of titanium or other material having a thermal conductivity less than or equal to the thermal conductivity of titanium.

6. The apparatus of claim 1, wherein the lock nut has a tool-head engagement structure for manual tightening of the lock nut against the valve pin nut.

7. A method of axially coupling or decoupling an electric actuator to a valve pin in an injection manifold apparatus, comprising:

providing an injection molding apparatus comprising:

a manifold defining a resin channel for conveying liquid resin from an injection molding machine toward a mold cavity;

a nozzle for conveying liquid resin from the resin channel to the mold cavity;

a valve pin configured for linear movement along a longitudinal axis of the nozzle to control flow of liquid resin through the nozzle;

an electric actuator having a body containing an electric motor and a linear drive shaft,

wherein both the electric motor and the linear drive shaft are contained within the body of the electric actuator, and

wherein the linear drive shaft has a bore extending along the longitudinal axis of the nozzle, and the housing has a bottom opening and a top opening providing access to opposite ends of the bore;

wherein the valve pin is directly or indirectly coupled to the drive shaft within the bore, such that linear movement of the drive shaft produces co-linear movement of the valve pin,

wherein the electric actuator body has a top opening and the bore extends through the length of the drive shaft to allow manual adjustment of the valve pin position,

wherein substantially an entire length of the bore extending through the drive shaft is internally threaded and the valve pin is directly or indirectly coupled to the drive shaft via an externally threaded valve pin nut threadingly engaging the internally threaded bore, and

wherein the valve pin nut has a tool-head engagement structure for manual positioning of the valve pin and valve pin nut with respect to the drive shaft; and

an externally threaded lock nut threadingly engaging the internally threaded bore and disposed adjacent a side of the valve pin nut opposite the valve pin; and

coupling or decoupling the valve pin directly or indirectly to the linear drive shaft via the bore through the drive shaft openings in the housing.

8. The apparatus of claim 1, wherein the electric actuator is mounted on a support attached to the manifold, and further comprises an anti-rotation plate disposed between a bottom of the support and the electric actuator and releasably attached to the bottom of the support, the anti-rotation plate having an aperture for passage of the valve pin, the aperture having a shape configured to engage a section of the valve pin having a non-circular profile to prevent rotation of the pin around the longitudinal axis of the nozzle.