CLAIMS

1. An injection molding apparatus, comprising:

a hot-runner manifold having a resin channel for conveying a resin melt toward a mold cavity;

a nozzle for conveying the resin melt to a mold cavity of a mold tool;

a valve pin linearly movable along a longitudinal axis of the nozzle to control flow of the resin melt through the nozzle and into the mold cavity;

an electric actuator having a housing containing a stator, a rotor, and a transmission for converting rotary movement of the rotor into linear movement of a traveling drive shaft along a rotational axis of the rotor and within a cylindrical space defined by an inner boundary of the rotor and opposite ends of the rotor, wherein a head of the valve pin is directly or indirectly coupled to the drive shaft within the cylindrical space; and

a position sensor located inside the actuator housing.

2. The apparatus of claim 1, 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 and a removal of the valve pin in both directions.

3. The apparatus of claim 1, wherein the electric actuator is mounted on a minimum of one support attached directly or indirectly to a support plate which is directly or indirectly mounted to a manifold.

4. The apparatus of claim 2, wherein the bore extending through the drive shaft is at least partially 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.

5. The apparatus of claim 4, 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.

6. The apparatus of claim 5, further comprising 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.

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

8. The apparatus of claim 1, wherein the electric actuator is mounted on one or several supports attached directly or indirectly via a support plate to the manifold, and further comprises an anti-rotation part disposed between a bottom of the support plate or the manifold and the electric actuator and releasably attached to the bottom of the support plate or the surface of the manifold, the anti-rotation part 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.

9. The apparatus of claim 3, wherein the actuator is positioned on the support plate or the manifold to provide a gap between a surface of the actuator housing facing the hot-runner manifold and a surface of the support plate facing the actuator housing.

10. The apparatus of claim 1, wherein the position sensor is an absolute contactless linear position sensor configured to monitor position of the valve pin to facilitate precise control of resin flow to a mold cavity.

11. An injection molding apparatus, comprising:

a hot-runner manifold having a resin channel for conveying a resin melt toward a mold cavity;

a nozzle for conveying the resin melt to a mold cavity of a mold tool;

a valve pin linearly movable along a longitudinal axis of the nozzle to control flow of the resin melt through the nozzle and into the mold cavity;

an actuator having a housing containing an electric motor having an output drive shaft coupled to the valve pin, and an integral cooling block contained within the housing and having a fluid conduit for circulating a liquid coolant; and

a contactless linear position sensor located inside the actuator housing.

12. An injection molding apparatus, comprising:

a hot-runner manifold having a resin channel for conveying a resin melt toward a mold cavity;

a nozzle for conveying the resin melt to a mold cavity of a mold tool;

a valve pin linearly movable along a longitudinal axis of the nozzle to control flow of the resin melt through the nozzle and into the mold cavity;

an actuator having a housing containing an output drive shaft coupled to the valve pin; and

an insulating support plate mounted directly on the hot-runner manifold, wherein the housing is positioned via separate or integrated support columns on the support plate which provides a thermal barrier between the surface of the housing facing the hot-runner manifold and a surface of the support plate facing the housing.

13. The apparatus of claim 12, wherein the insulating support and or support plate is made of stainless steel or titanium.

14. The apparatus of claim 12, wherein each of the support columns has a bore extending axially through a majority of a length of the column, the bore being threaded along at least a part of a length of the bore to allow a threaded fastener to be threaded into a minority of the length of the bore, whereby a void can be provided within the bore to reduce heat transfer along the column.

15. An injection molding apparatus, comprising:

a hot-runner manifold having a resin channel for conveying a resin melt toward a mold cavity;

a nozzle for conveying the resin melt to a mold cavity of a mold tool;

a valve pin linearly movable along a longitudinal axis of the nozzle to control flow of the resin melt through the nozzle and into the mold cavity;

an actuator having a housing; and

a contactless linear position sensor located in the housing at an end of the actuator that is opposite the end adjacent the hot-runner manifold and configured to monitor a position of the valve pin to facilitate precise control ofresin flow to a mold cavity.

16. The apparatus of claim 15, wherein the sensor is an inductive linear position sensor or a Hall effect linear position sensor.

17. The apparatus of claim 15, wherein the sensor is an optical sensor.

18. The apparatus of claim 15, wherein the sensor is potentiometer.

19. The apparatus of claim 1, wherein the valve pin is suspended within the height of the actuator.

20. The apparatus of claim 19,

wherein the valve pin is directly or indirectly coupled to the drive shaft of the actuator within a volume radially inward of the rotor of the electric motor.