CLAIMS

1. A linear actuator (42) comprising:

a motor (44) configured to provide a rotational input for turning a shaft (64);

a gearbox (48) that is mechanically coupled to the shaft (64) and provides a rotational output when driven by the shaft (64);

a pinion (68) that is mechanically coupled to the gearbox (48) and rotates in response to the rotational output of the gearbox (48);

a rack (66) coupled to a load (52), wherein the rack causes the load (52) to move linearly in response to the rotation of the pinion (68); and

an override system (54) capable of driving the gearbox (48) to generate the rotational output when the motor (44) is non-operational.

2. The linear actuator (42) of claim 1, comprising

a first anti-back-driving device (46) disposed between the motor (44) and shaft (64) to prevent back-driving of the motor (44); and

a second anti-back-driving device (56) disposed between the override system (54) and the gearbox (48) to prevent back-driving of the override system (54).

3. The linear actuator (42) of claim 2, wherein the linear actuator (42) is configured such that, when neither the motor (44) nor the override system (54) is driving the gearbox (48), the load (52) is maintained in its current position.

4. The linear actuator (42) of claim 1, comprising a housing (60) that houses the motor (44), gearbox (48), pinion (68), rack (66), and override system (54), wherein the housing (60) comprises a first housing portion (61) containing the motor (44) and a second housing portion (62) containing the gearbox (48), wherein the first (61) and second portions (62) form separate respective enclosures.

5. The linear actuator (42) of claim 4, wherein the first housing portion (61) contains a first lubricating fluid having a first viscosity and the second housing portion (62) contains a second lubricating fluid having a second viscosity, the first viscosity being less than the second viscosity.

6. The linear actuator (42) of claim 5, comprising a compensation bladder (63) that equalizes pressure between the first and second lubricating fluids.

7. The linear actuator (42) of claim 1, comprising a position indicator sensor (58) that senses the linear position of the load (52).

8. The linear actuator (42) of claim 7, wherein the position indicator sensor (58) comprises a linear variable differential transformer.

9. The linear actuator (42) of claim 1, comprising a local position indicator (59) coupled to the load (52) that converts linear motion of the load (52) into rotary motion to indicate the position of the load (52).

10. The linear actuator (42) of claim 1, wherein the load (52) comprises a stem (52) of a valve (30), and wherein the linear actuator (42) is configured such that, in operation, the linear motion raises or lowers the stem (52) to vary a flow rate through the valve (30).

CLAIMS

1. A linear actuator comprising:

a motor configured to provide a rotational input for turning a shaft;

a gearbox that is mechanically coupled to the shaft and provides a rotational output when driven by the shaft;

a pinion that is mechanically coupled to the gearbox and rotates in response to the rotational output of the gearbox;

a rack coupled to a load, wherein the rack causes the load to move linearly in response to the rotation of the pinion;

an override system capable of driving the gearbox to generate the rotational output when the motor is non-operational; and

a housing that houses the motor, gearbox, pinion, rack, and override system, wherein the housing comprises a first housing portion containing the motor and a second housing portion containing the gearbox, wherein the first and second housing portions form separate respective enclosures, the first housing portion contains a first lubricating fluid having a first viscosity, and the second housing portion contains a second lubricating fluid having a second viscosity, the first viscosity being less than the second viscosity.

2. The linear actuator of claim 1, comprising a first anti-back-driving device disposed between the motor and shaft to prevent back-driving of the motor; and

a second anti-back-driving device disposed between the override system and the gearbox to prevent back-driving of the override system.

3. The linear actuator of claim 2, wherein the linear actuator is configured such that, when neither the motor nor the override system is driving the gearbox, the load is maintained in its current position.

4. The linear actuator of claim 1, comprising a compensation bladder that equalizes pressure between the first and second lubricating fluids.

5. The linear actuator of claim 1, comprising a position indicator sensor that senses the linear position of the load.

6. The linear actuator of claim 5, wherein the position indicator sensor comprises a linear variable differential transformer.

7. The linear actuator of claim 1, comprising a local position indicator coupled to the load that converts linear motion of the load into rotary motion to indicate the position of the load.

8. The linear actuator of claim 1, wherein the load comprises a stem of a valve, and wherein the linear actuator is configured such that, in operation, the linear motion raises or lowers the stem to vary a flow rate through the valve.