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(71) Applicant *(for all designated States except US)*: **IMPCO TECHNOLOGIES (CANADA), LLC** [US/—]; 100 Hollinger Crescent, Kitchner, Ontario N2K 2Z3 (CA).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **LALL, Jason** [CA/CA]; 17 Burke Crt., Guelph, Ontario N1L 1J2 (CA). **HURNIK, Jakub** [CA/CA]; 49 Rhonda Rd., Unit 124, Guelph, Ontario N1H 7A4 (CA). **LAKERDAS, Andrew** [CA/CA]; 39 Monte Vista Crescent, London, Ontario N6J 4P2 (CA).

(74) Agent: **FINKELSTEIN, Don**; Law Offices of Don Finkelstein, 3858 Carson Street, Suite 216, Torrance, CA 90503 (US).

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(54) Title: ELECTRONIC PRESSURE REGULATOR

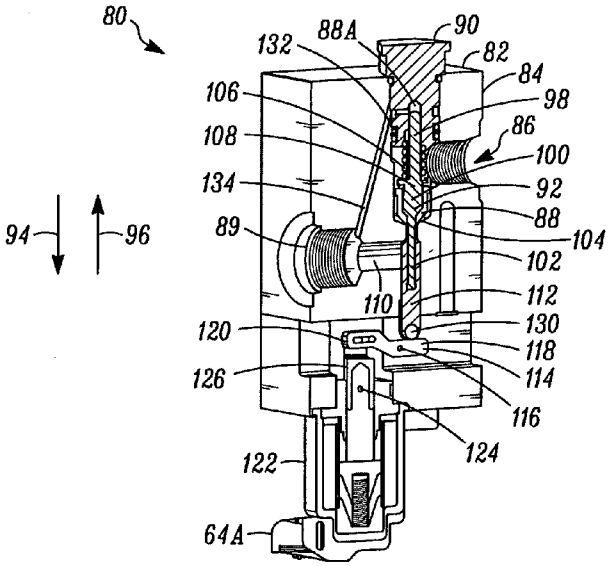

FIG. 3

(57) Abstract: A pressure regulator includes a valve, mechanical advantage device, actuator, controller and pressure sensor. The valve is disposed between an inlet port and an outlet port. The valve includes a pintle and seat.. An actuator is provided to move the pintle away from the seat to allow the flow of gas from the inlet port to the outlet port and a pintle return spring is provided to bias the pintle towards seat. The actuator is configured to move the pintle in response to the magnitude of a control signal. A control system is provided to receive a gas pressure signal from a pressure transducer at the outlet port which detects the gas pressure at the outlet port and generate a control signal having a magnitude proportional to the detected gas pressure.

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AMENDED CLAIMS
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Claim 1. A pressure regulator comprising:

a valve body having an inlet port and an outlet port, said inlet port for receiving a high pressure gas and ~~an~~ said outlet port for discharging gas at a pressure lower than said pressure at said inlet port;

a valve being disposed between said inlet port and said outlet port, said valve comprising a sliding pintle valve mounted for sliding movement in said valve body between open positions and a closed position, and said valve body having a pintle seal seat and said sliding pintle valve sealingly engaging said pintle seal seat for said sliding pintle valve in the closed position thereof and spaced from said pintle seal seat for said sliding pintle valve in said open positions thereof;

a pintle valve return spring engaging said sliding pintle valve and said valve body for yeildingly urging said sliding pintle valve towards said pintle seal seat;

an actuator operatively engaging said sliding pintle valve to selectively move the sliding pintle valve against the force of said pintle valve return spring to position said pintle valve in an open position thereof, said actuator comprising a mechanical advantage force device to multiply the force applied to said sliding pintle valve by said actuator;

a pressure sensor to detect gas pressure at said outlet port and generate a first control signal having a magnitude proportional to said detected gas pressure signal.

a control system for receiving said first control signal and powering said actuator

in response to the magnitude thereof.

Claim 2. The ~~arrangement~~ pressure regulator defined in Claim 1 wherein:

said actuator is a linear solenoid actuator.

Claim 3. The ~~arrangement~~ pressure regulator defined in Claim 1 wherein:

said actuator is a rotary actuator.

Claim 4. The ~~arrangement~~ pressure regulator defined in claim 1 and further comprising:

said mechanical advantage force device further comprises an actuator lever pivotally mounted on said valve body by a pivot pin, and said actuator lever has a first end spaced a first preselected distance from said pivot pin and a second end spaced a second preselected distance from said pivot pin and said second preselected distance is greater than said first preselected distance;

a pintle valve lifter slideably mounted in said valve body for movement with said sliding pintle valve.

Claim 5. The ~~arrangement~~ pressure regulator defined in claim 4 wherein:

said first end of said actuator lever operatively engages said pintle valve lifter to move said sliding pintle valve away from said seat; and

said second end of said actuator lever is moved by said actuator.

Claim 6. The ~~arrangement~~ pressure regulator defined in claim 5 and further comprising:

a ball member rotateably mounted on said pintle valve lifter for engagement with said first end of said actuator lever.

Claim 7. The ~~arrangement~~ pressure regulator defined in claim 6 wherein:

said sliding pintle valve further comprises an upper stem portion, a lower stem portion and a sealing portion intermediate said upper stem portion and said lower stem portion; said sealing portion for sealing engagement with said seal seat of said valve body ~~in~~ for said sliding pintle valve in said closed position thereof.

Claim 8. The ~~arrangement~~ pressure regulator defined in claim 7 wherein:

said pintle valve return spring surrounds said upper stem portion;

and said pintle valve lifter reciprocatingly ~~movable~~ moveable in said valve body and fixedly connected to said lower stem portion.

Claim 9. The ~~arrangement~~ pressure regulator defined in claim 1 and further comprising:

said mechanical advantage force device further comprises a tapered slider having a predetermined taper on an outer surface thereof, and said outer surface in contact with said sliding pintle valve;

said actuator is a linear solenoid actuator and said linear solenoid actuator connected to said tapered slider to move said tapered slider in reciprocating directions whereby said sliding pintle valve is moved away from said seal seat to an open position

thereof and said return spring moves said sliding pintle for engagement with said tapered slider for moving said sliding pintle towards said seal seat.

Claim 10. The ~~arrangement~~ pressure regulator defined in claim 1 wherein:

said control system further comprises an analog to digital converter for receiving said first control signal and generating a second control signal having a magnitude proportional to said first control signal;

Claim 11. The ~~arrangement~~ pressure regulator defined in claim 10 and further comprising:

a micro processor for receiving said second control signal and generating a third control signal having a magnitude proportional to said second control signal, and said third control signal is applied to power said actuator.

Claim 12. The ~~arrangement~~ pressure regulator defined in claim 11 and further comprising:

a vehicle ECU signal sent to said micro processor for modifying the magnitude of said third control signal.

Claim 13. The ~~arrangement~~ pressure regulator defined in claim 12 and further comprising:

an ASIC signal sent to said micro processor for modifying the magnitude of said third control signal