CLAIMS

1. A robot comprising:

a body;

a first robotic arm physically coupled to the body, the first robotic arm comprising a first end effector; and

a first hydraulic system comprising a first plurality of hydraulic components, the first hydraulic system operable to control the first end effector, wherein the first plurality of hydraulic components are integrated with the first robotic arm, wherein the first plurality of hydraulic components comprises a hydraulic drive member, a first drive piston coupled to the hydraulic drive member, a first actuator having a first actuation piston operative to drive a respective actuation of the first end effector, and a first hose hydraulically coupling the first drive piston to the first actuation piston, wherein the first hose is routed through an interior of the first robotic arm.

2. The robot of claim 1, further comprising:

a second robotic arm physically coupled to the body, the second robotic arm comprising a second end effector; and

a second hydraulic system comprising a second plurality of hydraulic components, the second hydraulic system operable to control the second end effector, the second plurality of hydraulic components integrated with the second robotic arm, wherein the second hydraulic system is hydraulically-isolated from the first hydraulic system.

3. The robot of claim 1, further comprising:

a second robotic arm physically coupled to the body, the second robotic arm comprising a second end effector; and

a second hydraulic system comprising a second plurality of hydraulic components, the second hydraulic system operable to control the second end effector, the second plurality of hydraulic components integrated with the second robotic arm, wherein the first hydraulic system and the second hydraulic system share a common hydraulic pump.

4. The robot of claim 3 wherein the common hydraulic pump is integrated with the robot.

5. The robot of claim 1, wherein the first hydraulic system comprises one or more actuators integrated with the first end effector, wherein the one or more actuators includes the first actuator, and wherein the first hydraulic system is operable to control the first end effector by the one or more actuators.

6. The robot of claim 5, wherein the first end effector is a hand, the hand comprising a plurality of digits, each digit of the plurality of digits comprising a respective actuator of the one or more actuators.

7. The robot of claim 5, wherein the first end effector is a hand comprising a plurality of digits, and wherein each digit of the plurality of digits comprises a respective plurality of actuators of the one or more actuators.

8. The robot of claim 6, wherein each of the one or more actuators provides a respective degree of freedom.

9. The robot of claim 1, wherein the hydraulic components of the first plurality of hydraulic components are located in an interior of the first robotic arm.

10. The robot of claim 9, wherein the first robotic arm is a humanoid arm.

11. The robot of claim 1, wherein at least one of the hydraulic components of the first plurality of hydraulic components is mounted on an exterior surface of the first robotic arm.

12. The robot of claim 1, wherein the hydraulic drive member comprises a motor, and wherein the first plurality of hydraulic components further comprises:

a plurality of drive pistons, each drive piston mechanically coupled to the motor, wherein the plurality of drive pistons includes the first drive piston;

a set of actuators, each actuator comprising an actuation piston, each actuation piston operable to drive a respective actuation of the first end effector, wherein the set of actuators includes the first actuator; and

a plurality of hoses, each hose of the plurality of hoses containing a respective volume of a hydraulic fluid, each hose hydraulically coupled to a respective drive piston at a respective first end and hydraulically coupled to a respective actuation piston at a respective second end.

13. The robot of claim 1, wherein the hydraulic drive member comprises a hydraulic pump, and wherein the first plurality of hydraulic components further comprises:

a reservoir for storing a first partial volume of a hydraulic fluid, the reservoir hydraulically coupled to an inlet of the hydraulic pump, the reservoir configurable to provide a positive pressure to the inlet of the hydraulic pump;

an accumulator for holding a second partial volume of the hydraulic fluid under pressure, the accumulator hydraulically coupled to an outlet of the hydraulic pump;

a set of actuators, each actuator comprising an actuation piston, each actuation piston operable to drive a respective actuation of the first end effector, wherein the set of actuators includes the first actuator;

a plurality of hoses, each hose of the plurality of hoses containing a respective volume of the hydraulic fluid, wherein the plurality of hoses includes the first hose;

a plurality of pressure valves, each pressure valve operable to control a hydraulic coupling of the accumulator to a respective actuation piston via a respective first at least one of the plurality of hoses; and

a plurality of exhaust valves, wherein each exhaust valve is operable to control a hydraulic coupling of the respective actuation piston to the reservoir via a respective second at least one of the plurality of hoses.

14. The robot of claim 13, wherein:

the plurality of pressure valves include at least one electrohydraulic servo pressure valve, each electrohydraulic servo pressure valve operable to control the hydraulic coupling of the accumulator to the respective actuation piston; and

the plurality of exhaust valves include at least one electrohydraulic servo exhaust valve, each electrohydraulic servo exhaust valve operable to control the hydraulic coupling of the respective actuation piston to the reservoir.

15. The robot of claim 14, further comprising a controller, the controller operable to open and close the at least one electrohydraulic servo pressure valve and the at least one electrohydraulic servo exhaust valve.

16. The robot of claim 1, wherein the first plurality of hydraulic components comprises:

a hydraulic pump;

a reservoir hydraulically coupled by a first hose to an inlet of the hydraulic pump;

an accumulator hydraulically coupled by a second hose to an outlet of the hydraulic pump;

a first pressure valve, a first port of the first pressure valve hydraulically coupled by a third hose to the accumulator;

an actuator hydraulically coupled by a fourth hose to a second port of the first pressure valve; and

a first exhaust valve, a first port of the first exhaust valve hydraulically coupled by a fifth hose to the actuator, a second port of the first exhaust valve hydraulically coupled by a sixth hose to the reservoir, wherein the hydraulic pump, the reservoir, the accumulator, the first pressure valve, the first exhaust valve, the actuator, and the first, the second, the third, the fourth, the fifth, and the sixth hoses form a hydraulic circuit.

17. The robot of claim 16, wherein a respective outer diameter of each of the first, the second, the third, the fourth, the fifth, and the sixth hoses is less than or equal to one-sixteenth of an inch (1/16 in.).

18. The robot of claim 16, wherein the actuator comprises a single actuation piston.

19. The robot claim 16, the first plurality of hydraulic components further comprising:

a second pressure valve, a first port of the second pressure valve hydraulically coupled by a seventh hose to the accumulator and a second port of the second pressure valve hydraulically coupled by an eighth hose to the actuator; and

a second exhaust valve, a first port of the second exhaust valve hydraulically coupled by an ninth hose to the actuator and a second port of the second exhaust valve hydraulically coupled by a tenth hose to the reservoir, wherein the actuator comprises a double actuation piston, and whereby the actuator becomes double-acting.

20. The robot of claim 16, wherein the first port of the first pressure valve is hydraulically coupled by the third hose to the accumulator via a pressure manifold, and the second port of the first exhaust valve is hydraulically coupled by the tenth hose to the reservoir via an exhaust manifold.