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(54) **HYDRAULIC POWER MODULE**

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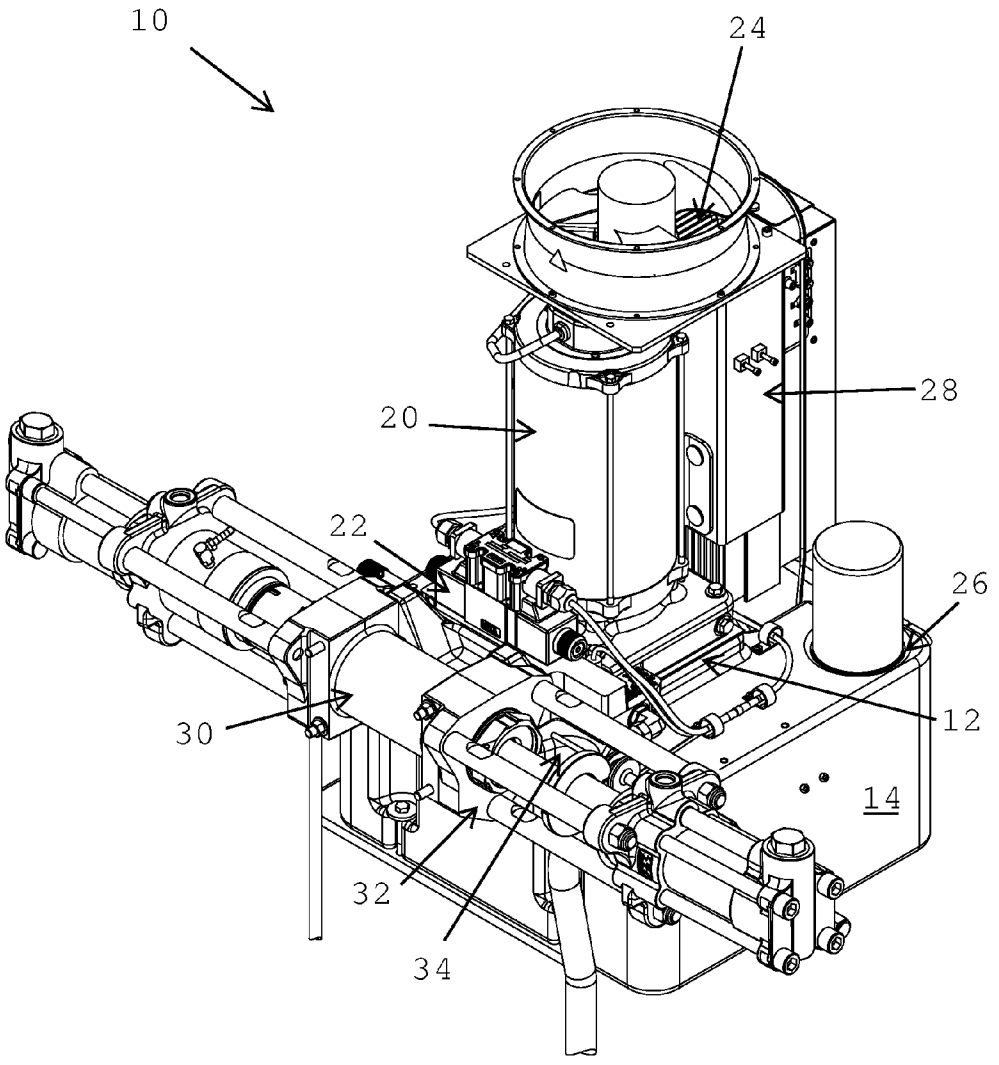
(57) **ABSTRACT**

The hydraulic power module **10** consists of 1) a hydraulic manifold **12** to route hydraulic fluid to the correct areas, 2) a hydraulic reservoir **14** that contains hydraulic fluid **16**,3) a hydraulic pump **18**,4) a DC servo motor **20**,5) a directional valve **22**,6) a cooling system **24** 7) an integrated filter housing **26** and 8) electronics—motor control **28** for controlling the DC servo motor **20**.



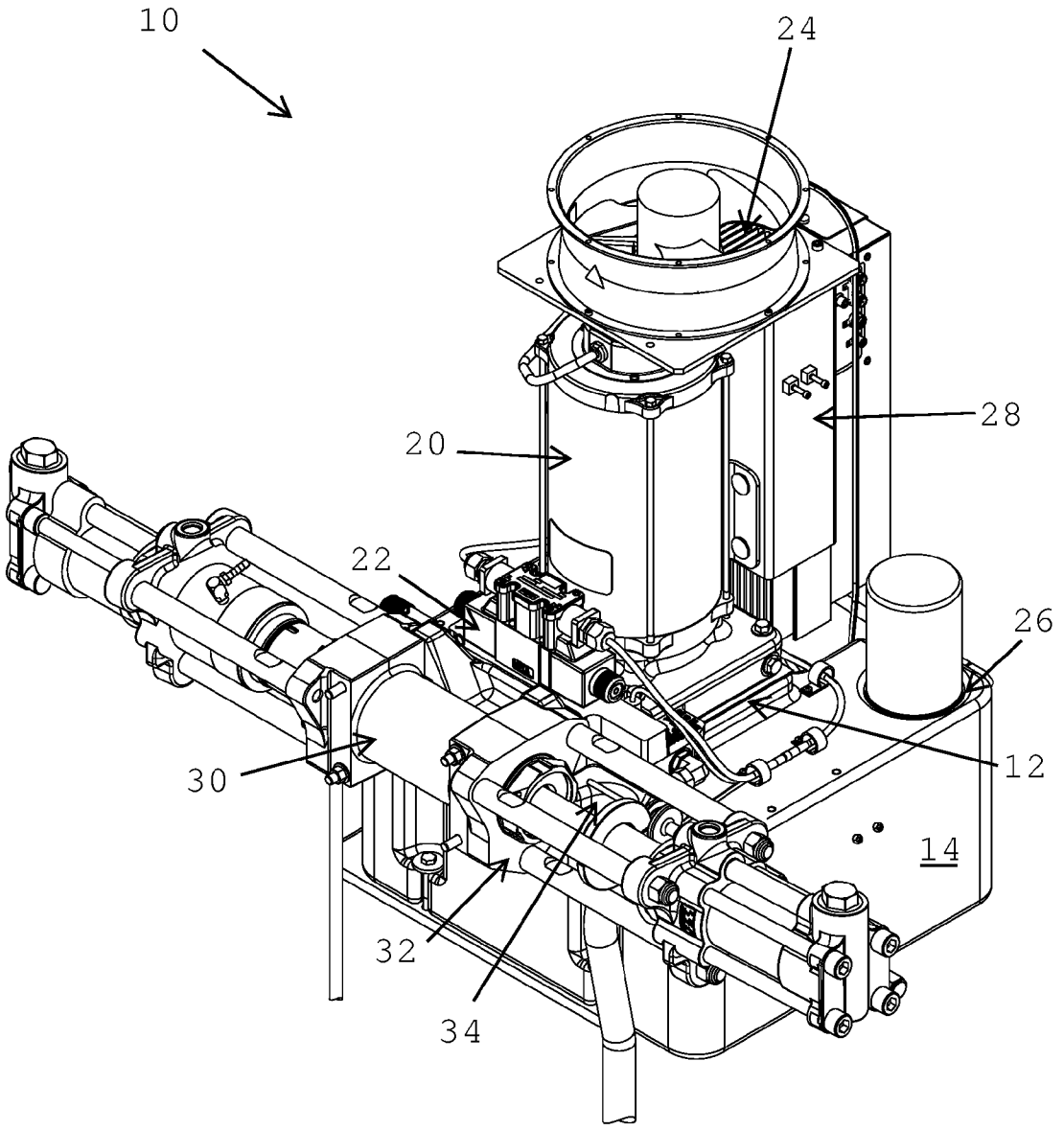


FIG. 1

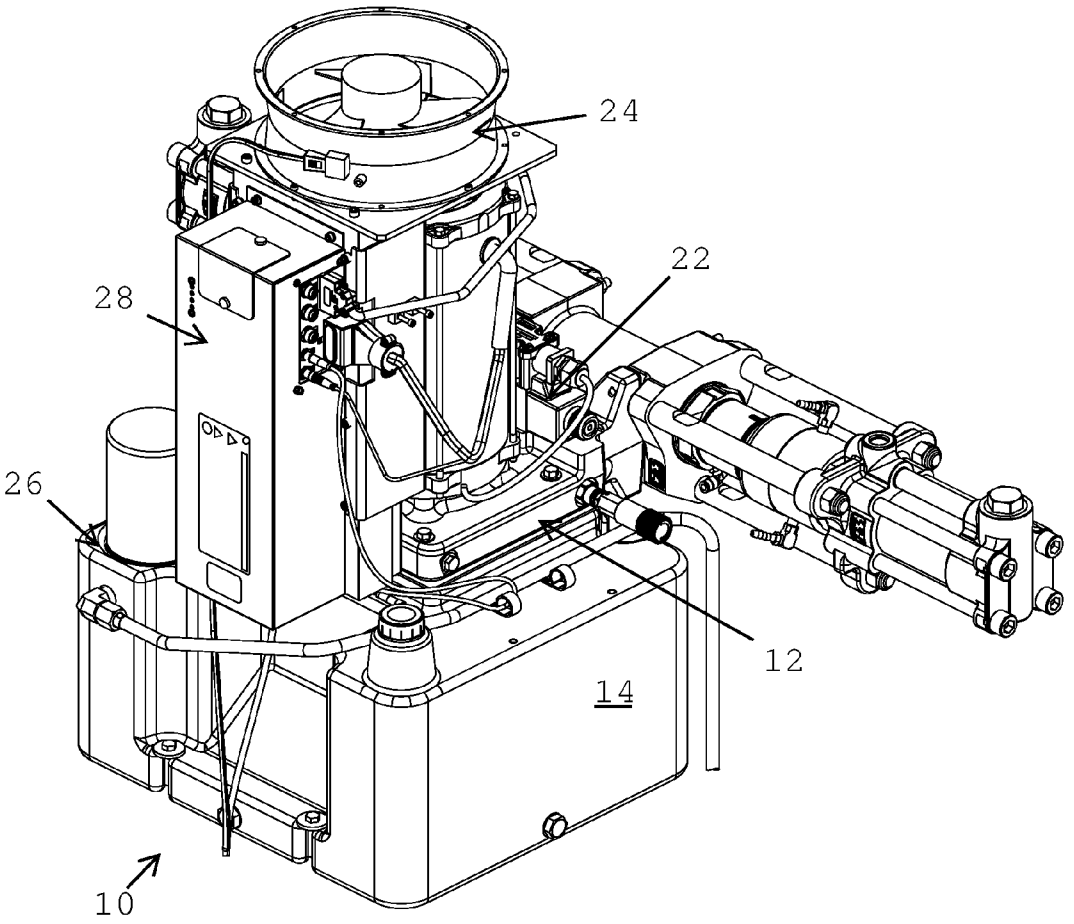


FIG. 2

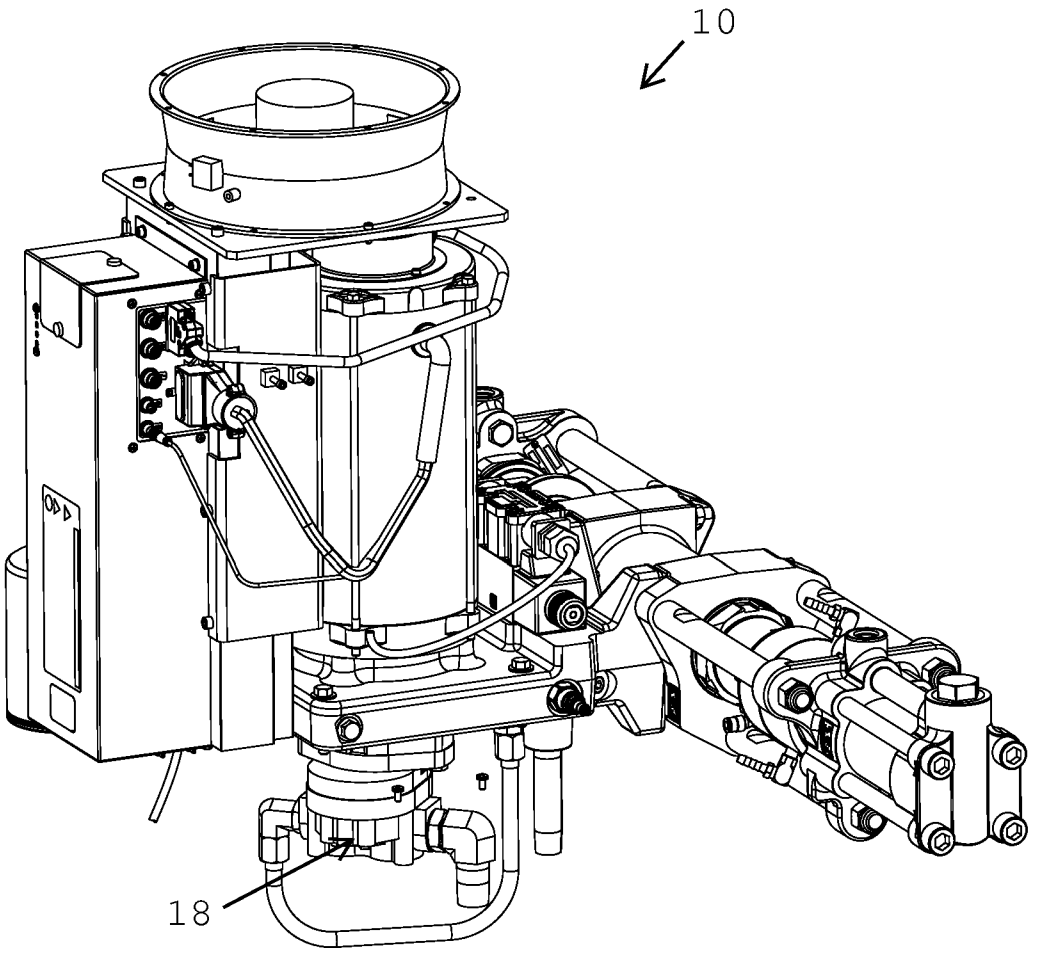


FIG. 3

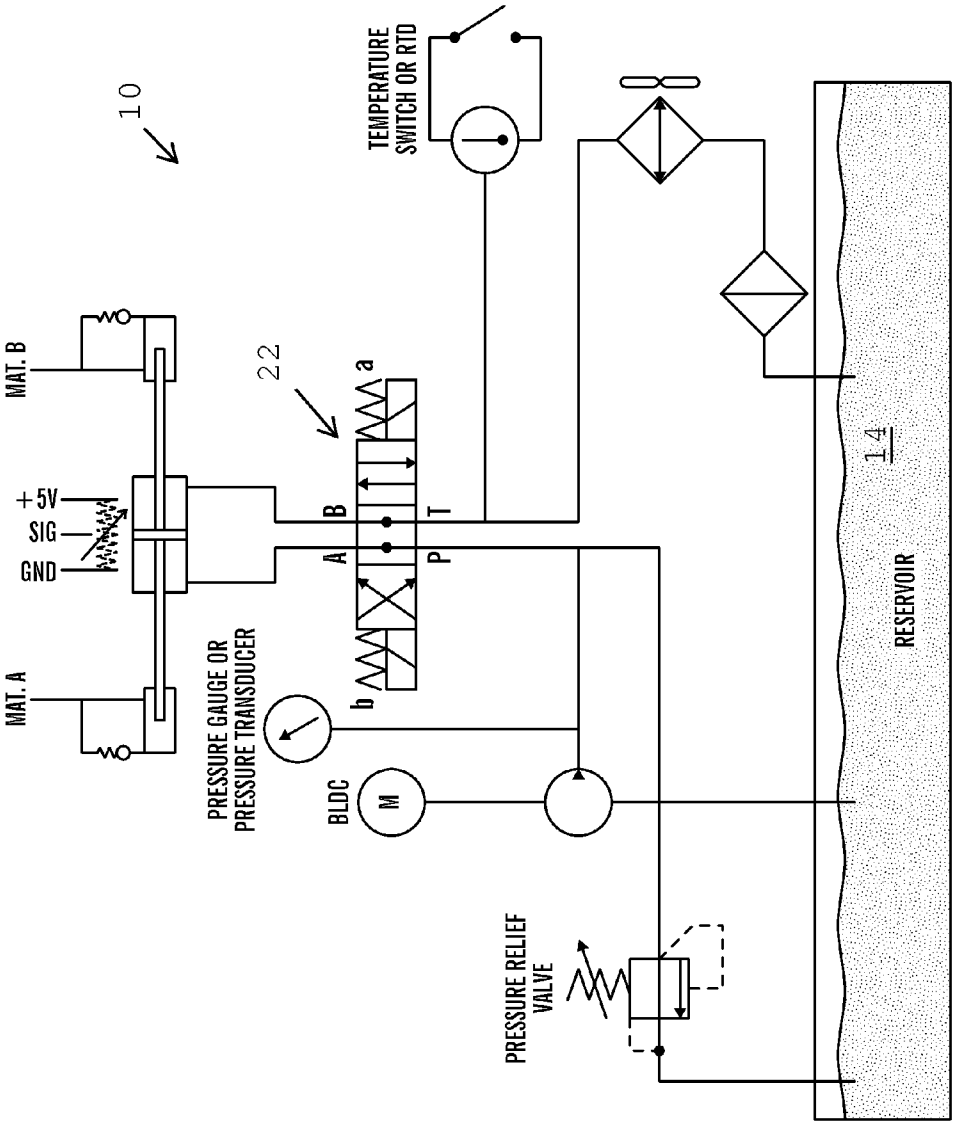
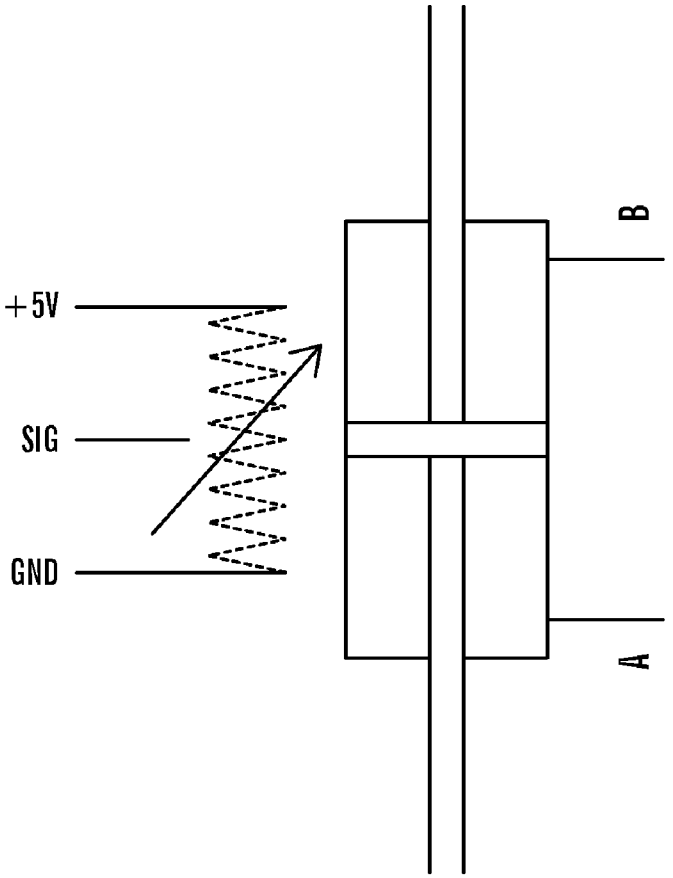

10
TEMPERATURE SWITCH OR RTD
MAT. B
+5V
SIG
GND
MAT. A
22
a
B
A
P
T
b
PRESSURE GAUGE OR PRESSURE TRANSDUCER
BLDC
M
PRESSURE RELIEF VALVE
14
RESERVOIR

FIG. 4



WHEN PRESSURIZED HYDRAULIC FLUID IS SUPPLIED TO LINE A, THE PISTON WILL MOVE TO THE RIGHT WITH SOME FORCE.
WHEN PRESSURIZED HYDRAULIC FLUID IS SUPPLIED TO LINE B, THE PISTON WILL MOVE TO THE LEFT WITH SOME FORCE.

FIG. 5

HYDRAULIC POWER MODULE

TECHNICAL FIELD

[0001] This application claims the benefit of U.S. application Ser. No. 61/229,298, filed Jul. 29. 2009, the contents of which are hereby incorporated by reference.

BACKGROUND ART

[0002] Hydraulic power modules for controlling fluid dispensing and other apparatus are well known.

DISCLOSURE OF THE INVENTION

[0003] It is an object of this invention to create a hydraulic power module that will drastically improve control, increase mechanical life, use a simplified design, reduce power consumption, reduce cooling requirements and reduce noise levels.

[0004] The hydraulic power module of the instant invention consists of 1) a hydraulic manifold to route hydraulic fluid to the correct areas, 2) a hydraulic reservoir that contains hydraulic fluid, 3) a hydraulic pump, 4) a DC servo motor, 5) a directional valve, 6) a cooling system and 7) an integrated filter housing 8) electronics—motor control for controlling the DC servo motor.

[0005] The hydraulic power module (HPM) works to supply hydraulic fluid to run a variety of configurations of hydraulic cylinder(s). The DC servo motor is directly coupled to the hydraulic pump via a hydraulic manifold. When the motor is spinning, the pump directs hydraulic fluid through the manifold, to the directional valve. The HPM signals the directional valve to divert flow to either side of a hydraulic cylinder. The HPM, in conjunction with a sensor (example: flow meter in the fluid line, a linear transducer associated with the hydraulic cylinder, etc.), provides hydraulic fluid at such a rate to accurately control the velocity of a piston in a hydraulic cylinder. It can also hold the position of the hydraulic cylinder piston stationary against an opposing force. This results in an accurate flow rate or constant dynamic and static pressures.

[0006] There are a number of advantages to the system of the instant invention such as dramatic increases in control by using a DC servo motor and motor controller. Another result is improved system mechanical life in that when no flow is required, all parts stop moving which can result in less wear.

[0007] The invention reduces hydraulic cooling requirements by allowing flow to stop when no flow is required.

[0008] The invention results in a simplified mechanical design compared to traditional AC power pack systems. The dynamic response of the HPM eliminates the need for accumulators.

[0009] The HPM control allows for full torque output at zero speed. This allows the system to respond almost instantly to requests for flow (no delay while pressure builds.)

[0010] The dynamic response of the HPM allows for compensation of system variations allowing the hydraulic power module to produce a more constant pressure and/or flow than traditional AC technology. The HPM control allows for changes in pressure and flow without any mechanical adjustment (pressure compensated pumps, dump valves, etc.) The HPM controls the motor torque, speed and position where a typical AC power pack only controls speed resulting in improved control.

[0011] Noise levels are lower than traditional AC power pack designs. The design and control lend itself to reduced power consumption. The system will only use energy on an as needed basis. Closed loop flow control based on a linear transducer provides equivalent control at a lower cost point. The algorithm will work with any hydraulic pump. When new pressure and/or flow are required, simply replace the pump.

[0012] These and other objects and advantages of the invention will appear more fully from the following description made in conjunction with the accompanying drawings wherein like reference characters refer to the same or similar parts throughout the several views.

BRIEF DESCRIPTION OF DRAWINGS

[0013] FIG. **1** shows a front view of the HPM of the instant invention.

[0014] FIG. **2** shows a rear view of the HPM of the instant invention.

[0015] FIG. **3** shows a view with the reservoir removed showing the pump of the HPM of the instant invention.

[0016] FIG. **4** is a schematic view of the HPM of the instant invention.

[0017] FIG. **5** shows a schematic view of the fluid circuit of the HPM of the instant invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0018] The hydraulic power module **10** of the instant invention consists of 1) a hydraulic manifold **12** to route hydraulic fluid to the correct areas, 2) a hydraulic reservoir **14** that contains hydraulic fluid **16**, 3) a hydraulic pump **18**, 4) a DC servo motor **20**, 5) a directional valve **22**, 6) a cooling system **24** 7) an integrated filter housing **26** and 8) electronics—motor control **28** for controlling the DC servo motor **20**.

[0019] The hydraulic power module (HPM) **10** works to supply hydraulic fluid **16** to run a variety of configurations of hydraulic cylinder(s) **30**. The DC servo motor **20** is directly coupled to the hydraulic pump **18** via a hydraulic manifold **12**. When the motor **20** is spinning, the pump **18** directs hydraulic fluid **16** through the manifold **12**, to the directional valve **22**. The HPM **10** signals the directional valve **22** to divert flow to either side of a hydraulic cylinder **30**. The HPM **10**, in conjunction with a sensor **32** (example: flow meter in the fluid line, a linear transducer **34** associated with the hydraulic cylinder, etc.), provides hydraulic fluid **16** at such a rate to accurately control the velocity of a piston in a hydraulic cylinder **30**. It can also hold the position of the hydraulic cylinder **30** piston stationary against an opposing force. This results in an accurate flow rate or constant dynamic and static pressures.

[0020] It is contemplated that various changes and modifications may be made to the hydraulic power module without departing from the spirit and scope of the invention as defined by the following claims.

1. The hydraulic power module for controlling at least one hydraulic cylinder, said hydraulic cylinder comprising:
a hydraulic manifold to route hydraulic fluid;
a hydraulic reservoir for containing hydraulic fluid;
a hydraulic pump;
a DC servo motor;
a directional valve;
a cooling system; and
a motor control for controlling said DC servo motor.

2. The hydraulic power module of claim **1** and further comprising an integrated filter housing.

3. The hydraulic power module of claim **1** wherein motor control is capable of holding pressure under conditions of no flow without rotation of said motor.

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