embodiments it may be provided for the pump to not only automatically cycle the wrench to completely tighten or loosen the faster but also shut down when a proper torque is achieved.

[0007] ~~In accordance with one embodiment of the present invention, a hydraulic flow sensing apparatus is provided. The apparatus includes: a manifold; a hole in the manifold in fluid communication with a fluid pathway; a poppet valve in the hole in the manifold configured to move when fluid in the pathway flows; and a proximity switch configured to detect movement of the poppet valve.~~

According to a first aspect of the present invention, there is provided a hydraulic flow sensing apparatus comprising: a manifold; a hole in the manifold in fluid communication with a fluid pathway; a poppet valve in the hole in the manifold configured to move when fluid in the pathway flows; a proximity switch configured to detect movement of the poppet valve, wherein the manifold, hole, poppet valve and proximity switch forming a hydraulic circuit; and a directional control valve in fluid communication with the hydraulic circuit and operatively connected to a microcontroller.

[0007a] According to a second aspect of the present invention, there is provided a hydraulic flow sensing apparatus comprising: a manifold; a hole in the manifold in fluid communication with a fluid pathway; a poppet valve in the hole in the manifold configured to move when fluid in the pathway flows; a proximity switch configured to detect movement of the poppet valve; a second poppet valve located in a second hole in the manifold and a second proximity switch configured to detect movement of the second poppet valve; a microcontroller operatively connected to the proximity switches; hydraulic pump in fluid communication with the fluid pathway and configured to pressurize the fluid in the fluid pathway, the hydraulic pump operatively connected to the microcontroller; a fluid reservoir; a second fluid pathway in fluid communication with the pump, the first fluid pathway, the fluid reservoir, and the poppet valves as to create a hydraulic circuit; and a directional control valve in fluid communication with the

hydraulic circuit and operatively connected to the microcontroller.

[0008] ~~In accordance with another embodiment of the present invention,~~ According to a third aspect of the present invention, there is provided a method of operating a hydraulic circuit ~~may also be provided. The method may include~~including: operating a pump to pressurized fluid in the hydraulic circuit; flowing fluid through the circuit in a first direction; moving a first poppet valve to a first position via the flow in the first flow path; moving the first poppet valve to a second position when no flow in the first flow path is detected by the poppet valve; sending a signal to a microcontroller when the poppet valve moves to the second position; moving a flow reversing valve to a reverse flow in at least part of the circuit when the signal is sent to the microcontroller; and opening a dump valve to provide fluid communication between the circuit and a reservoir when neither the first nor second poppet valve detect flow in either the first or second flow paths for a predetermined amount of time.

[0009] ~~In accordance with yet another embodiment of the present invention, a hydraulic flow sensing apparatus is provided. The apparatus may include: a manifold; a hole in the manifold in fluid communication with a fluid pathway; means for moving when sensing hydraulic fluid flow in the hole in the manifold configured to move when fluid in the pathway flows; and means for detecting movement of the means for moving.~~

According to a fourth aspect of the present invention, there is provided a hydraulic flow sensing apparatus comprising: a manifold; a hole in the manifold in fluid communication with a fluid pathway; means for moving when sensing hydraulic fluid flow in the hole in the manifold configured to move when fluid in the pathway flows; means for detecting movement of the means for moving wherein the manifold, the hole, the means for moving and the means for detecting create hydraulic circuit; and a directional control valve in fluid communication with the hydraulic circuit and operatively connected to a microcontroller.

What is claimed is:

1. A hydraulic flow sensing apparatus comprising:

a manifold;

a hole in the manifold in fluid communication with a fluid pathway;

a poppet valve in the hole in the manifold configured to move when fluid in the pathway flows; and

a proximity switch configured to detect movement of the poppet valve.

2. The hydraulic flow sensing apparatus of claim 1, wherein the poppet valve and the hole are dimensioned to have the poppet valve tightly fit in the hole as to approximately form a seal.

3. The hydraulic flow sensing apparatus of claim 1, further comprising a microcontroller operatively connected to the proximity switch.

4. The hydraulic flow sensing apparatus of claim 1, further comprising a second poppet valve located in a second hole in the manifold and a second proximity switch configured to detect movement of the second poppet valve.

5. The hydraulic flow sensing apparatus of claim 1, further comprising a hydraulic pump in fluid communication with the fluid pathway and configured to pressurize the fluid in the fluid pathway.

6. The hydraulic flow sensing apparatus of claim 1, further comprising:

second poppet valve located in a second hole in the manifold and a second proximity switch configured to detect movement of the second poppet valve;

a microcontroller operatively connected to the proximity switches;

hydraulic pump in fluid communication with the fluid pathway and configured to pressurize the fluid in the fluid pathway, the hydraulic pump operatively connected to the microcontroller;

a fluid reservoir; and

a second fluid pathway in fluid communication with the pump, the first fluid pathway, the fluid reservoir, and the poppet valves as to create a hydraulic circuit.

7. The hydraulic flow sensing apparatus of claim 6, further including a directional control valve in fluid communication with the hydraulic circuit and operatively connected to the microcontroller.

8. The hydraulic flow sensing apparatus of claim 7, where in the microcontroller is configured to control the directional control valve based on signals received from the proximity switches.

9. The hydraulic flow sensing apparatus of claim 8, further comprising hydraulic connectors configured to allow a hydraulic tool to be connected to the first and second flow paths.

10. The hydraulic flow sensing apparatus of claim 9, wherein the directional control valve is configured to change the direction of flow with in at least part of the first and second fluid pathways.

11. The hydraulic flow sensing apparatus of claim 10, or in the proximity switches provide a signal to the microcontroller indicating that the poppet valves either in a first or second position; and the microcontroller measures amount of time the proximity switch indicates that a poppet valves is in one of the positions.

12. The hydraulic flow sensing apparatus of claim 11, wherein the microcontroller is configured to store the measured amount of time.

13. The hydraulic flow sensing apparatus of claim 10, further comprising a relief valve operatively connected to the hydraulic circuit.

14. The hydraulic flow sensing apparatus of claim 13, wherein the relief valve is configured to move to a pressure relieving position when a pressure within the hydraulic circuit is at or above about 1,500 psi.

15. The hydraulic flow sensing apparatus of claim 10, further comprising a hand pendant having at least one of the following actuators: a stop actuator, an automatic actuator, and a manual actuator.

16. The hydraulic flow sensing apparatus of claim 15, wherein the microcontroller is configured to operate the pump until the proximity switches provide a signal to the microcontroller indicative of no fluid flowing through the hydraulic circuit for an amount of time.

17. The hydraulic flow sensing apparatus of claim 15, wherein the microcontroller is configured to operate the pump to provide pressure to the hydraulic circuit while at least one of either the automatic actuator and the manual actuator is actuated until the microcontroller receives signals from the proximity switches indicating that no flow has occurred through the hydraulic circuit for a length of time.

18. The hydraulic flow sensing apparatus of claim 10, further comprising at

least one of the following valves: pressure regulator valve in fluid communication with the hydraulic circuit wherein the pressure regulator valve may be adjusted by a user to move to an open position when a pressure in the hydraulic circuit is at a set pressure and a dump valve in fluid communication with the hydraulic circuit defaulted to a dump position to allow fluid communication with the reservoir and configured to move to a position blocking fluid communication with tween the hydraulic circuit and the reservoir when the dump valve is energized as controlled by the microcontroller.

19. A method of operating a hydraulic circuit comprising:

operating a pump to pressurized fluid in the hydraulic circuit;

flowing fluid through the circuit in a first direction;

moving a first poppet valve to a first position via the flow in the first flow path;

moving the first poppet valve to a second position when no flow in the first flow path is detected by the poppet valve;

sending a signal to a microcontroller when the poppet valve moves to the second position;

moving a flow reversing valve to a reverse flow in at least part of the circuit when the signal is sent to the microcontroller; and

opening a dump valve to provide fluid communication between the circuit and a reservoir when neither the first nor second poppet valve detect flow in either the first or second flow paths for a predetermined amount of time.

20. A hydraulic flow sensing apparatus comprising:

a manifold;

a hole in the manifold in fluid communication with a fluid pathway;

means for moving when sensing hydraulic fluid flow in the hole in the

manifold configured to move when fluid in the pathway flows; and

means for detecting movement of the means for moving.

Claims

1. A hydraulic flow sensing apparatus comprising:

a manifold;

a hole in the manifold in fluid communication with a fluid pathway;

a poppet valve in the hole in the manifold configured to move when fluid in the pathway flows;

a proximity switch configured to detect movement of the poppet valve, wherein the manifold, hole, poppet valve and proximity switch forming a hydraulic circuit; and

a directional control valve in fluid communication with the hydraulic circuit and operatively connected to a microcontroller.

2. The hydraulic flow sensing apparatus of claim 1, wherein the poppet valve and the hole are dimensioned to have the poppet valve tightly fit in the hole as to approximately form a seal.

3. The hydraulic flow sensing apparatus of claim 1, further comprising a microcontroller operatively connected to the proximity switch.

4. The hydraulic flow sensing apparatus of claim 1, further comprising a second poppet valve located in a second hole in the manifold and a second proximity switch configured to detect movement of the second poppet valve.

5. The hydraulic flow sensing apparatus of claim 1, further comprising a hydraulic pump in fluid communication with the fluid pathway and configured to pressurize the fluid in the fluid pathway.

6. A hydraulic flow sensing apparatus comprising:

a manifold;

a hole in the manifold in fluid communication with a fluid pathway;

a poppet valve in the hole in the manifold configured to move when fluid in the pathway flows;

a proximity switch configured to detect movement of the poppet valve;

a second poppet valve located in a second hole in the manifold and a second proximity switch configured to detect movement of the second poppet valve;

a microcontroller operatively connected to the proximity switches;

hydraulic pump in fluid communication with the fluid pathway and configured to pressurize the fluid in the fluid pathway, the hydraulic pump operatively connected to the microcontroller;

a fluid reservoir;

a second fluid pathway in fluid communication with the pump, the first fluid pathway, the fluid reservoir, and the poppet valves as to create a hydraulic circuit; and

a directional control valve in fluid communication with the hydraulic circuit and operatively connected to the microcontroller.

7. The hydraulic flow sensing apparatus of claim 6, where in the microcontroller is configured to control the directional control valve based on signals received from the proximity switches.

8. The hydraulic flow sensing apparatus of claim 7, further comprising hydraulic connectors configured to allow a hydraulic tool to be connected to the first and second flow paths.

9. The hydraulic flow sensing apparatus of claim 8, wherein the directional control valve is configured to change the direction of flow with in at least part of the first and second fluid pathways.

10. The hydraulic flow sensing apparatus of claim 9, or in the proximity switches provide a signal to the microcontroller indicating that the poppet valves either in a first or second position; and the microcontroller measures amount of time the proximity switch indicates that a poppet valves is in one of the positions.

11. The hydraulic flow sensing apparatus of claim 10, wherein the microcontroller is configured to store the measured amount of time.

12. The hydraulic flow sensing apparatus of claim 9, further comprising a relief valve operatively connected to the hydraulic circuit.

13. The hydraulic flow sensing apparatus of claim 12, wherein the relief valve is configured to move to a pressure relieving position when a pressure within the hydraulic circuit is at or above about 1,500 psi.

14. The hydraulic flow sensing apparatus of claim 9, further comprising a hand pendant having at least one of the following actuators: a stop actuator, an automatic actuator, and a manual actuator.

15. The hydraulic flow sensing apparatus of claim 14, wherein the microcontroller is configured to operate the pump until the proximity switches provide a signal to the microcontroller indicative of no fluid flowing through the hydraulic circuit for an amount of time.

16. The hydraulic flow sensing apparatus of claim 14, wherein the microcontroller is configured to operate the pump to provide pressure to the hydraulic circuit while at least one of either the automatic actuator and the manual actuator is actuated until the microcontroller

receives signals from the proximity switches indicating that no flow has occurred through the hydraulic circuit for a length of time.

17. The hydraulic flow sensing apparatus of claim 9, further comprising at least one of the following valves: pressure regulator valve in fluid communication with the hydraulic circuit wherein the pressure regulator valve may be adjusted by a user to move to an open position when a pressure in the hydraulic circuit is at a set pressure and a dump valve in fluid communication with the hydraulic circuit defaulted to a dump position to allow fluid communication with the reservoir and configured to move to a position blocking fluid communication with tween the hydraulic circuit and the reservoir when the dump valve is energized as controlled by the microcontroller.

18. A method of operating a hydraulic circuit comprising:

operating a pump to pressurized fluid in the hydraulic circuit;

flowing fluid through the circuit in a first direction;

moving a first poppet valve to a first position via the flow in the first flow path;

moving the first poppet valve to a second position when no flow in the first flow path is detected by the poppet valve;

sending a signal to a microcontroller when the poppet valve moves to the second position;

moving a flow reversing valve to a reverse flow in at least part of the circuit when the signal is sent to the microcontroller; and

opening a dump valve to provide fluid communication between the circuit and a reservoir when neither the first nor second poppet valve detect flow in either the first or second flow paths for a predetermined amount of time.

19. A hydraulic flow sensing apparatus comprising:

a manifold;

a hole in the manifold in fluid communication with a fluid pathway;

means for moving when sensing hydraulic fluid flow in the hole in the manifold configured to move when fluid in the pathway flows;

means for detecting movement of the means for moving wherein the manifold, the hole, the means for moving and the means for detecting create hydraulic circuit; and

a directional control valve in fluid communication with the hydraulic circuit and operatively connected to a microcontroller.