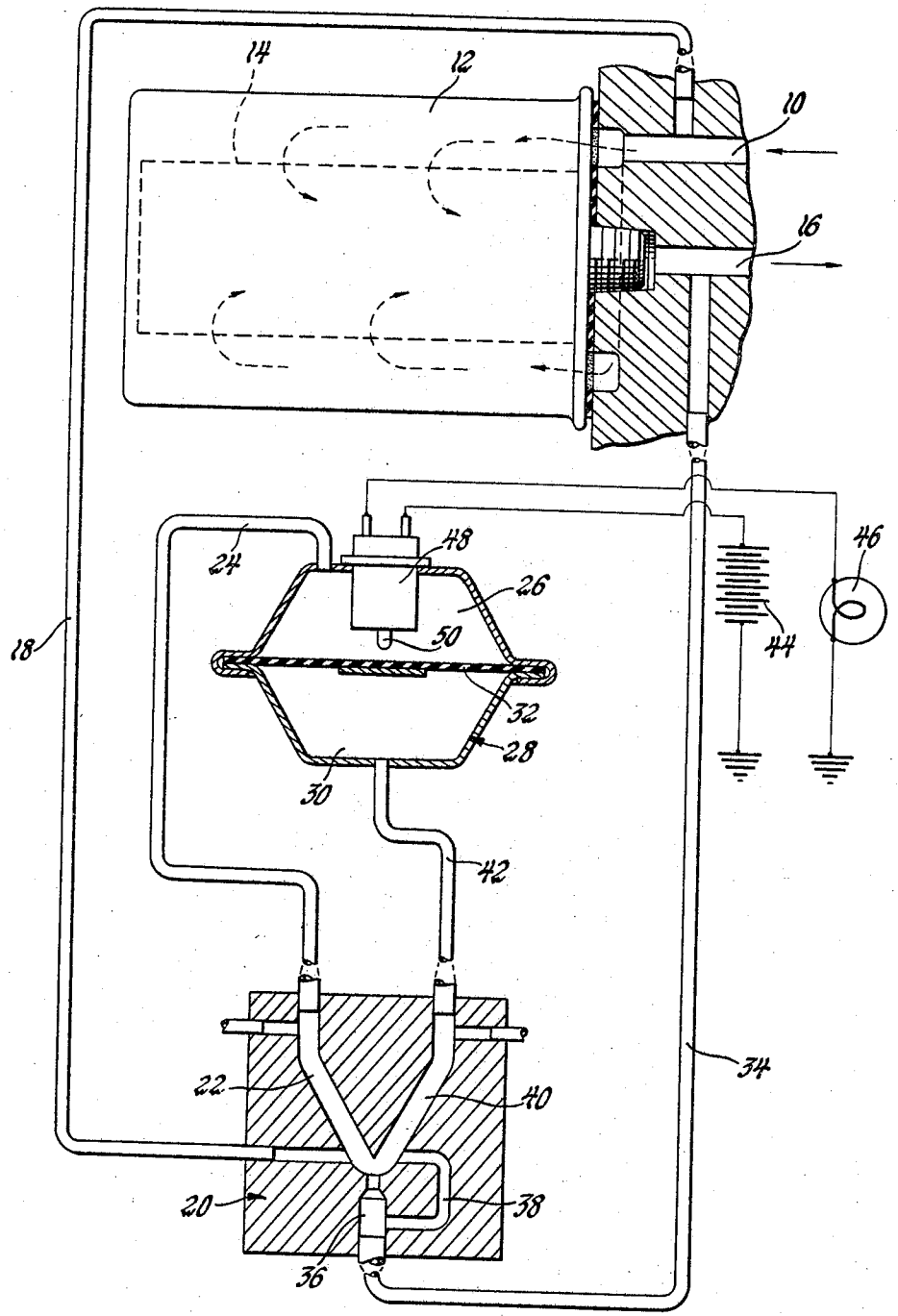
Dec. 9, 1969 D. L. JONES, JR 3,482,696

OIL FILTER INDICATING SYSTEM

Filed April 3, 1967



INVENTOR.
David L. Jones, Jr.

BY
Donald P. Sebuecki

ATTORNEY

United States Patent Office 3,482,696 Patented Dec. 9, 1969

3,482,696

OIL FILTER INDICATING SYSTEM

David L. Jones, Jr., Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Filed Apr. 3, 1967, Ser. No. 628,023
Int. Cl. B01d 35/02
U.S. Cl. 210—90 3 Claims

ABSTRACT OF THE DISCLOSURE

In a preferred form, this invention covers a fluid amplifier responsive to a differential in pressure across a fluid filter to provide a visual indication of an abnormal pressure drop thereacross.

This invention relates to fluid system condition indicators and more particularly to a fluid amplifier controlled oil filter condition indicator.

It is an object of the present invention to provide a visual indication of the capability of a fluid filter to cleanse fluid.

It is another object of the present invention to provide an improved oil filter condition indicator utilizing a fluid amplifier and a fluid motor.

It is still another object of the present invention to provide an improved fluid system condition indicator responding to an abnormal pressure drop between selected portions of the fluid system to provide a visual indication of the abnormal drop.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of the present invention is clearly shown.

In the drawing:

In the single figure drawing, a diagrammatic illustration of the subject invention is shown.

Referring to the drawing, fluid enters inlet **10** and passes into filter **12** and is forced through filter pack **14** to outlet **16**. In the example given, it is assumed that the oil pressure source is a typical engine driven oil pump but it is obvious that the present invention finds equal utility in the environment of a fuel system.

Pressure from inlet **10** is communicated through line **18** to fluid amplifier **20** so as to provide a bias on leg **22** thereof. Pressure in leg **22** is communicated through line **24** to chamber **26** of vacuum motor **28**. Vacuum motor **28** is separated into compartment **26** and compartment **30** by diaphragm **32** normally centrally disposed in said vacuum motor.

Pressure at outlet **16** of filter **12** is communicated through line **34** to fluid amplifier **20** and provides a power stream at inlet **36** of amplifier **20**. Bias circuit **38** of amplifier **20** causes a wall attachment in leg **22** under normal operating conditions when the pressure drop across inlets **10** and **16** is negligible. Output leg **40** of amplifier **20** communicates through line **42** with chamber **30**.

Battery **44** provides electrical power for lamp **46** when switch **48** is closed. Switch **48** includes actuator button **50** which is depressed by a movement of diaphragm **32** under operating conditions when a positive pressure exists in line **42**.

In operation, engine oil pump pressure is admitted through inlet **10** to filter **12** and forced through filter pack **14** toward outlet **16**. In this manner, the oil is cleansed and a negligible pressure drop takes place between inlet **10** and outlet **16**.

Under conditions of normal operation, when filter pack

14 is not clogged, the pressure at inlet **10** is communicated as a bias through line **18** to leg **22** of amplifier **20**. At the same time, pressure at outlet **16** is communicated through line **34** and provides a power stream at inlet **36** of fluid amplifier **20**. Due to the constant bias on leg **40** provided by bias circuit **38**, the power stream from inlet **36** normally attaches to a wall of leg **22** and passes through leg **22** to line **24**. Diaphragm **32** is normally at the position shown in the drawing wherein actuator button **50** is not energized. This is due to the fact that very little flow occurs in leg **40** with all the pressure provided by the power stream exerted on the upper surface of diaphragm **32**. It is clear that with the power stream deflected to leg **22**, a minimum pressure is communicated from inlet **10** because of the free flow of oil through filter **12**.

When a blockage occurs in filter **12**, pressure will build up at inlet **10** and decrease at outlet **16**. The power stream flow is diminished at inlet **36** and the bias leg **22** is positively increased. The bias on leg **22**, when increased, causes a shift of the power stream to leg **40** resulting in the buildup of oil pressure in chamber **30** of vacuum motor **28**. Diaphragm **32** is deflected into actuator button **50** causing an energization of lamp **46**. In this manner, a vehicle operator is immediately apprised of the fact that an abnormal pressure drop has occurred across inlet **10** and outlet **16**. Armed with this information, a vehicle operator can effect proper maintenance of filter **12**.

The utility of the subject invention is extended into any environment where a filtering device is involved in view of the response of the subject system to a pressure differential. The sizes of the passages include amplifier **20**, and the setting of bias circuit **38** can vary the response of the subject system so that air, gasoline, or oil can be monitored with equal effectiveness.

While the embodiment of the present invention, as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is:

1. In combination, a fluid filter device having an inlet for ingress of fluid and an outlet for egress of filtered fluid and an indicating means for indicating when a pressure drop of a predetermined magnitude occurs across the inlet and outlet of the fluid filter device, said indicating means comprising an electrical indicator device for providing an indication, when energized, that a pressure drop in excess of a predetermined magnitude has occurred, switch means in an operative electric circuit with said electrical indicator device and effecting energization of the latter when actuated, and control means including a pressure responsive means for controlling actuation and deactuation of said switch means and fluid amplifier means operatively connected with the inlet and outlet of said filter device and which is operable to actuate said pressure responsive means to actuate said switch means to energize said indicator device in response to a pressure drop in excess of a predetermined magnitude occurring across the inlet and outlet of the filter device, said fluid amplifier means having an inlet leg in communication with one of said inlet and outlet of said filter device and an outlet means in communication with said pressure responsive means, and biasing circuit means operatively connected with said filter device and fluid amplifier means and constructed and arranged to shift the fluid stream flowing through said inlet leg to effect actuation of said pressure responsive means when a pressure drop in excess of said predetermined magnitude occurs across said inlet and outlet of the filter device.

2. In combination, a filter device having an inlet for ingress of fluid and an outlet for egress of filtered fluid and an indicating means for indicating when a pressure drop of a predetermined magnitude occurs across the inlet

and outlet of the fluid filter device, said indicating means comprising an indicator lamp for providing a visual indication, when energized, that a pressure drop in excess of the predetermined magnitude has occurred, switch means in an operative electric circuit with said indicator lamp and which effects energization of the latter when actuated, and control means responsive to a pressure drop of a predetermined magnitude occurring across the inlet and outlet of the fluid filter device for actuating said switch means to energize said lamp, said control means comprising a pressure responsive means including a movable member movable between a first position in which it effects actuation of said switch and a second position in which it effects deactuation of said switch means, a fluid amplifier means having an inlet leg and a pair of divergent outlet legs and with the inlet leg being in communication with the outlet of said fluid filter device, one of said outlet legs being in communication with one side of said movable member of said pressure responsive means and the other of the outlet legs being in communication with the other side of the movable member of said pressure responsive means, a first bias circuit for communicating fluid from said inlet of said fluid filter device to bias the stream of fluid flowing through said inlet leg of the fluid amplifier from said one outlet leg toward the other outlet leg, a second bias circuit for communicating fluid from said inlet of said fluid amplifier to bias the stream of fluid flowing through said inlet leg from said other outlet leg toward said one outlet leg, said second bias circuit exerting a greater biasing force upon said fluid stream than said first bias circuit when the pressure drop across the inlet and outlet of said fluid filter device is less than a predetermined magnitude whereby the stream of fluid flowing through the inlet leg of the fluid amplifier flows through said one outlet leg thereof to cause said movable element to be biased toward its second position, said first bias circuit exerting a greater biasing force on said fluid stream flowing from said inlet leg than said second bias circuit when the pressure drop across the fluid filter device is greater than a predetermined magnitude to cause the fluid stream to be switched from said one outlet leg to the other outlet leg to cause said movable element to be moved toward its first position in which it actuates the switch to effect energization of the lamp.

3. In combination, an oil filter of an automotive vehicle and having an inlet for ingress of oil under pressure and an outlet for egress of filtered oil and an indicating means for indicating when a pressure drop of a predetermined magnitude occurs across the inlet and outlet of the

oil filter device, said indicating means comprising a lamp for providing an indication, when energized, that a pressure drop in excess of a predetermined magnitude has occurred, a switch means in an operative electric circuit with said lamp and effecting energization of the latter when actuated, a pressure responsive means for actuating and de-actuating said switch means, said pressure responsive means including a housing having a diaphragm for dividing the housing into first and second chambers and with said switch being located in said first chamber, a fluid amplifier having an inlet leg and a pair of outlet legs, one of the outlet legs being in communication with said first chamber of said pressure responsive means and the other of the outlet legs being in communication with said second chamber of said pressure responsive means, said inlet leg of said fluid amplifier means being in communication with the outlet of said oil filter, a first bias circuit in communication with the inlet of the oil filter for biasing the fluid stream flowing through the inlet of the fluid amplifier from said one outlet leg toward its other outlet leg, a second bias circuit means in communication with the inlet leg of the fluid amplifier device for biasing the fluid stream emanating from the inlet leg of the fluid amplifier device from said other outlet leg toward said one outlet leg, said second bias circuit exerting a greater biasing force than said first bias circuit when the pressure drop across the inlet and outlet of the oil filter is less than a predetermined magnitude, said first bias circuit exerting a greater biasing force against said fluid stream emanating from said inlet leg when a pressure drop in excess of a predetermined magnitude occurs across the inlet and outlet of the oil filter, said fluid stream when flowing through said other outlet leg causing said diaphragm to be flexed to actuate the switch to energize the lamp.

References Cited

UNITED STATES PATENTS

2,632,566	3/1953	Morrison	210—90 X
2,943,446	7/1960	Goodall et al.	210—90 X
3,122,165	2/1964	Horton	137—81.5 X
3,330,483	7/1967	Lewis	137—81.5 X
3,331,509	7/1967	Gray	210—90

SAMIH N. ZAHARNA, Primary Examiner

U.S. Cl. X.R.

116—70; 137—81.5