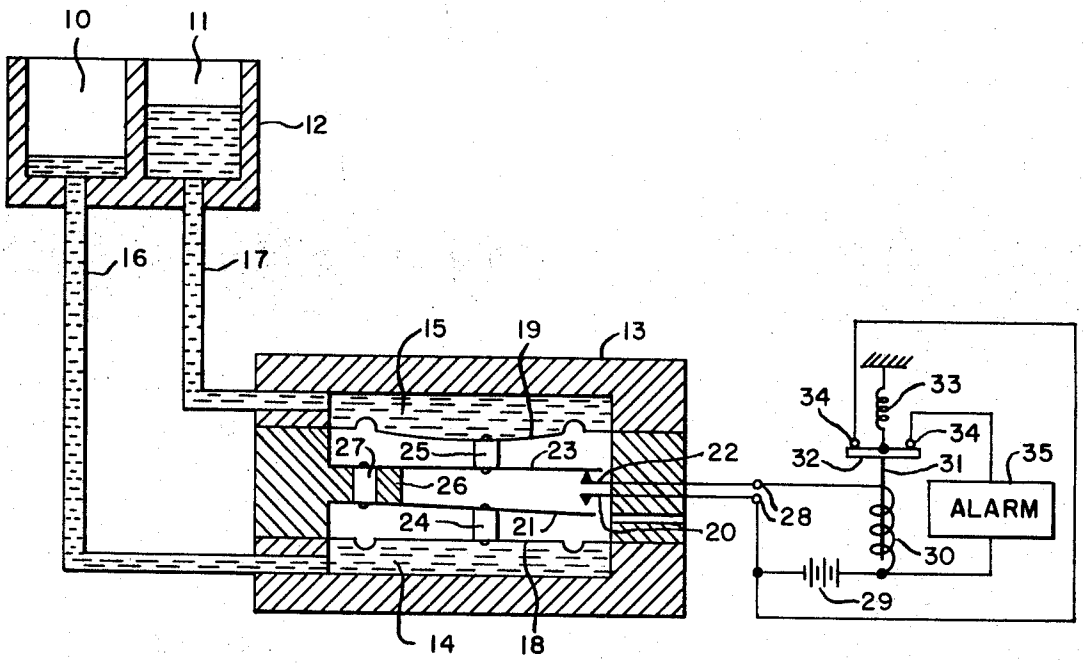
Oct. 13, 1970 S. I. GREENE 3,534,329

FLUID-PRESSURE SENSOR FOR TWO INDEPENDENT FLUID SUPPLIES

Filed Sept. 18, 1967



United States Patent Office 3,534,329 Patented Oct. 13, 1970

3,534,329

FLUID-PRESSURE SENSOR FOR TWO INDEPENDENT FLUID SUPPLIES

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Filed Sept. 18, 1967, Ser. No. 668,556
Int. Cl. B60t 17/22
U.S. Cl. 340—52 6 Claims

ABSTRACT OF THE DISCLOSURE

A fail-safe fluid-pressure sensor for a system including two independent fluid reservoirs comprises a housing having two independent spaced fluid compartments for independent connection to the reservoirs, each of the compartments being closed by a flexible diaphragm. In the space between the two compartments are located two normally open switches, each adjacent one of the diaphragms and including a stationary contact and a flexible contact member disposed to be actuated to engage the stationary contact upon the flexure of its associated diaphragm in response to a predetermined fluid level in its respective reservoir. The contact members are electrically interconnected and the sensor is provided with electrical terminals connected to the stationary contacts, whereby absence of fluid in either or both of the reservoirs opens the electrical circuit between the terminals.

BACKGROUND OF THE INVENTION

While this invention is of general application, it is particularly adapted for monitoring a dual fluid-brake system for automobiles.

As a safety factor, new automobiles are generally equipped with two completely independent fluid-brake systems, each having its own fluid reservoir. It is desirable to provide the driver of an automobile having such equipment with a warning signal in the event the fluid falls below a predetermined level in either reservoir.

It is an object of the invention, therefore, to provide a single fail-safe fluid-pressure sensor for such a system including two independent fluid supplies.

SUMMARY OF THE INVENTION

In accordance with the invention, there is provided a fail-safe fluid-pressure sensor for a system including two independent fluid supplies comprising a housing having two indpendent spaced fluid compartments for independent connection to the fluid supplies, each of such compartments includings a flexible closure element and a pair of independently operable switches each disposed adjacent one of the flexible closure elements in the space between the two compartments and including a stationary contact and a flexible contact member disposed to be actuated from its normal position by flexure of its associated closure element in response to predetermined fluid pressure in its respective fluid compartment. The sensor also comprises an alarm circuit responsive to the operation of either of said flexible contact members to its normal position, whereby absence of fluid pressure in either or both of the compartments energizes said alarm circuit.

For a better understanding of the present invention, together with other and further objects thereof, reference is had to the following description, taken in connection with the accompanying drawing, while its scope will be pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWING

The single figure of the drawing illustrates, partially schematically and partly in section, a fluid-pressure sensor for two independent fluid supplies embodying the invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now specifically to the drawing, there is represented a fail-safe fluid-pressure sensor for a system including two fluid supplies, specifically two liquid reservoirs **10** and **11**, disposed in a common housing **12**. The sensor comprises a housing **13** having two independent spaced fluid compartments **14** and **15** for independent connection to the reservoirs **10** and **11** by fluid conduits **16** and **17**, respectively, it being assumed that the reservoirs **10**, **11** are elevated with respect to the housing **13**. The compartments **14**, **15** include flexible closure elements, specifically flexible diaphragms **18** and **19**, respectively. A switch is disposed adjacent each of the diaphragms **18**, **19** in the space between the compartments **14**, **15**. Each of such switches is shown as being of the normally open type, the first switch including a stationary contact **20** and a flexible contact member **21** adjacent the flexible diaphragm **18** and the second of such switches including a stationary contact **22** and a flexible contact **23** adjacent the diaphragm **19**.

Each of the flexible contact members **21**, **23** is disposed to be actuated from its normal position and to engage its associated stationary contact by flexure of its associated diaphragm in response to predetermined fluid pressure in its respective one of the compartments **14**, **15**, specifically in response to a predetermined fluid level in its respective one of the reservoirs **10**, **11**. Specifically, the contact member **21** is connected with the diaphragm **18** by a post **24** while the contact member **23** is connected with the diaphragm **19** by a post **25**.

The housing **13** has an internal projection **26** in the space between the compartments **14** and **15** and the flexible contacts **21** and **23** are supported on opposite faces of the projection and are electrically connected by a conductive eyelet, rivet, or like member **27** extending through the projection **26** and securing the contact members **21** and **23** thereto. The sensor further comprises an alarm circuit responsive to operation of either of the flexible contact members **21**, **23** to its normal position. Specifically, a pair of external electrical terminals **28**, **28** are connected to the stationary contacts **20**, **22** respectively, and these terminals are connected with an electrical source, such as a battery **29**, in series with the winding **30** of a relay having an armature **31** and a contact member **32** biased by a spring **33** to close relay contacts **34**, **34** when the relay is deenergized. The contacts **34**, **34** are connected in a circuit with the battery **29** and an alarm device **35**, which may be either audible or visual, or both. The switches **20**, **21** and **22**, **23** have been shown as the normally open type and connected in series, so that the opening of either in response to low liquid level opens the circuit to initiate an alarm. However, it will be obvious that the switches may be of the normally closed type and connected in parallel, so that the closing of either in response to low liquid level closes the circuit to initiate an alarm.

It is believed the operation of the fluid-pressure sensor of the invention will be apparent from the foregoing description. In case either fluid supply is normal, for example if the level of the fluid is above some predetermined level, as shown in reservoir **11**, the fluid pressure in compartment **15** will deflect the diaphragm **19** to actuate the contact member **23** to engage the stationary contact **22**. Similarly, if the fluid level in the reservoir **10** were also above a predetermined level, the diaphragm **18** would actuate the contact member **21** to engage its stationary contact **20**, in which case an electrical circuit would be completed between the terminals **28**, **28** to energize the relay winding **30** and open the circuit at the relay contacts **34**,

34 to deenergize the alarm device 35. That is, the relay 30, 31, 32 is responsive only to closing of both of the switches 20, 21 and 22, 23 to open the circuit of the alarm device 35.

However, in case the fluid pressure in either or both of the compartments 14, 15 falls below a predetermined value, for example if the fluid in the reservoir 10 falls below a predetermined level as indicated, then the diaphragm 18 is not actuated, the flexible contact 21 returns to its normal circuit-opening position, and the electrical circuit between the terminals 28, 28 is opened, the relay winding 30 is deenergized, and the relay contacts 34, 34 closed by the spring 33 to complete the circuit for the alarm device 35. Thus, the fluid-pressure sensor described is a fail-safe device since, if the fluid pressure in either or both of the compartments 14, 15 falls below a predetermined value, due to any failure in the associated fluid systems or in the event of any malfunction of the switches 20, 21 or 22, 23, the alarm device 35 will be energized as described to signal the operator of a failure in the system.

While there has been described what is, at present, considered to be the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein, without departing from the invention, and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A fail-safe fluid-pressure sensor for a system including two independent fluid supplies comprising:

a housing having two independent spaced fluid compartments for independent connection to the fluid supplies, each of said compartments including a flexible closure element;

a pair of independently operable switches each disposed adjacent one of said closure elements in the space between said compartments and including a stationary contact and a flexible contact member disposed to be actuated from its normal position by flexure of its associated closure element in response to predetermined fluid pressure in its respective fluid compartment; and

an alarm circuit responsive to the operation of either of said flexible contact members to its normal position, whereby absence of fluid pressure in either or both of said compartments energizes said alarm circuit.

2. A fail-safe fluid-pressure sensor in accordance with claim 1 in which each of said switches is of the normally open type and is actuated by its associated closure element to circuit-closing position.

3. A fluid-pressure sensor in accordance with claim 1 in which the two independent fluid supplies are independent liquid reservoirs elevated with respect to the sensor and the sensor responds to the liquids in such reservoirs.

4. A fluid-pressure sensor in accordance with claim 1 in which the housing has a projection extending centrally into the space between said compartments and said flexible contact members are supported on opposite faces of said projection; and an electrically conductive member extending through said projection and securing said flexible contact members thereto.

5. A fluid-pressure sensor in accordance with claim 1 in which the compartment flexible closure members are flexible diaphragms.

6. A fluid-pressure sensor in accordance with claim 2 including a normally closed alarm circuit and a relay responsive to the closing of both of said switches for opening said alarm circuit.

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U.S. Cl. X.R.

340—60; 200—81.4, 83