March 31, 1959 H. S. FRAKES 2,879,892

SIGNALING MEANS FOR OIL FILTER

Filed Dec. 1, 1952

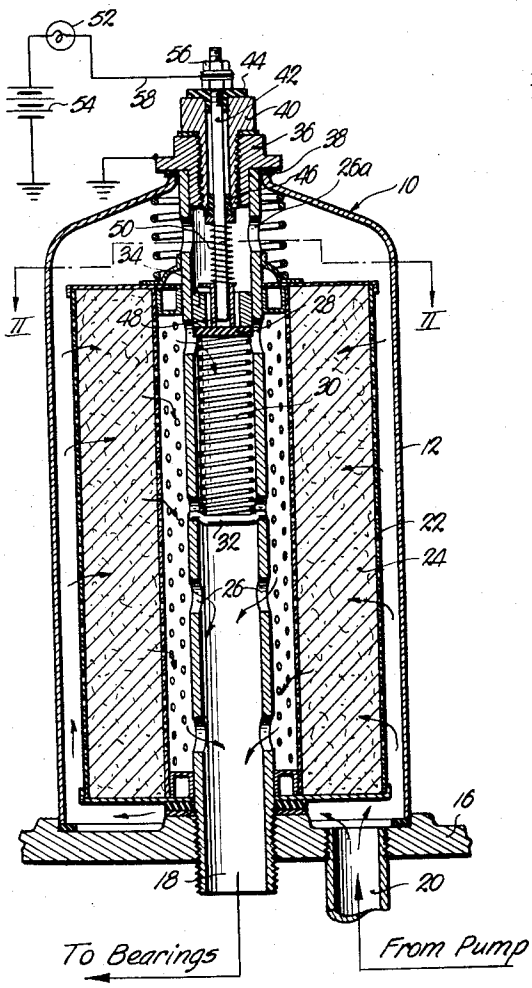


Fig. 1.

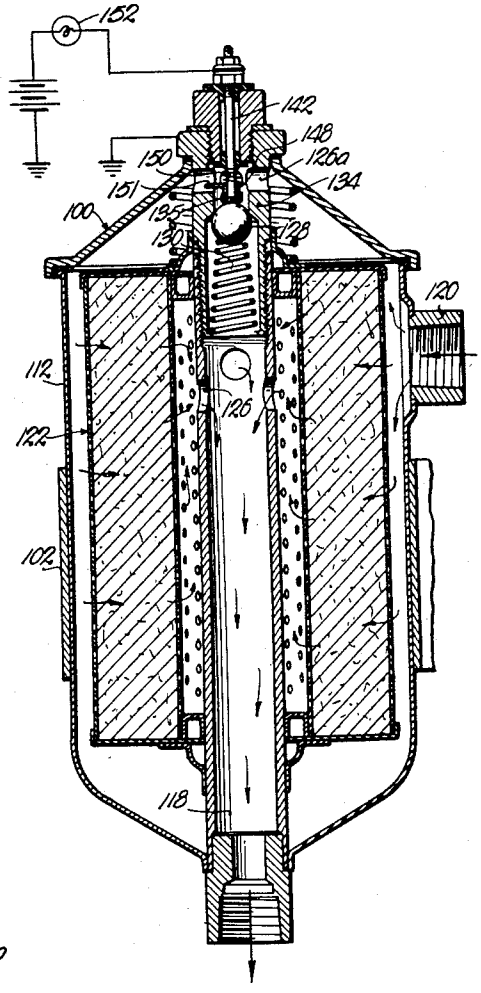


Fig. 3.

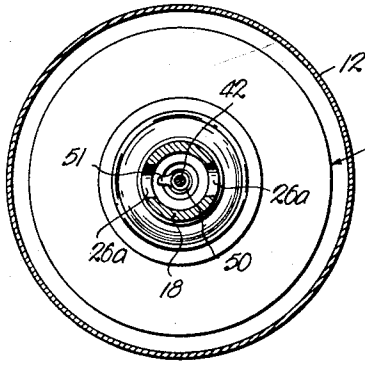


Fig. 2.

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United States Patent Office 2,879,892 Patented Mar. 31, 1959

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SIGNALING MEANS FOR OIL FILTER

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Application December 1, 1952, Serial No. 323,405

2 Claims. (Cl. 210—90)

This invention relates to improvements in accessory parts for internal combustion engines and relates more particularly to oil filtering means that is commonly employed in connection with such prime movers, the primary object being to provide an improved signaling assembly for indicating plugging of the filtering material and therefore the necessity of changing the filter cartridge.

It is common knowledge that lubricating oil filters of the above mentioned type are provided with a filtering element through which the oil is forced under pressure from the oil pump to the bearings. Periodic replacement of such element is necessary because the same becomes plugged or clogged with foreign matter removed from the oil, and failure to attend to such replacement is likely to cause serious damage to the engine bearings.

In accordance with this invention, therefore, it is an important aim to provide an electric signal, together with switching means that automatically energizes the circuit for the signal whenever the oil ceases to flow through the filtering element and by-passes the same in its flow to the bearings.

Another important object hereof is to provide a signal and switch structure therefor adapted especially for mounting on and operation in connection with a filter that has a by-pass in turn provided with a pressure responsive valve, the switching structure hereof being associated with the valve for operation thereby.

Other objects include the way in which a reciprocable conductor is spring biased against the pressure-responsive valve for movement therewith; the manner of connecting the movable conductor element in series with the electric circuit for the signal when the valve opens; the way in which the reciprocable conductor element is slidably mounted on a stationary conductor also in series with the circuit; and the manner of mounting the stationary conductor upon and insulating the same from the oil filter container.

In the drawing:

Figure 1 is a substantially central, cross-sectional view through one form of oil filter showing the signaling means of the present invention operably mounted thereon.

Fig. 2 is a cross-sectional view taken on irregular line II—II of Fig. 1; and

Fig. 3 is a central, cross-sectional view through another type of oil filter showing a slightly modified form of signaling means embodying the present invention.

As will hereinafter appear, the two forms of the invention are nearly identical and the same have been shown in connection with two differing types of filters to illustrate its universal adaptability.

In Figs. 1 and 2 of the drawing, a filter broadly designated by the numeral **10** consists of an outer container **12** that is open at its lowermost end and normally mounted on the internal combustion engine, shown fragmentarily in Fig. 1 and designated by the numeral **16**, by means of a central fastening tube **18** passing through the container **12**. When so mounted on the engine **16**, the lowermost end of the container **12** is closed and placed

in communication with a conduit **20** for directing the lubricating oil into the container **12** from the oil pump. The filtered oil emanating from the container **12** passes through the tube **18** to the engine bearings.

Filter **10** chosen for illustration is a so-called "full-flow" type of filter in that all of the oil passing from the pump to the bearings is forced through cartridge **22** in the container **12** until filtering material **24** within the cartridge **22** becomes so clogged or plugged with foreign material removed from the oil as to obstruct free flow thereof. It is noted that the cartridge **22** is perforated throughout and disposed in surrounding relationship to the tube **18**. Cartridge **22** is also spaced from all of the inner walls of the container **12**, and the tube **18** is provided with a plurality of openings **26** for receiving the filtered oil from the cartridge **22**, all as indicated by arrows in Fig. 1 of the drawing.

While the oil is also pumped into the tube **18** at the uppermost end thereof through openings **26***a*, such oil normally cannot flow to the engine bearings because of the provision of a normally closed valve **28** in the tube **18** below the openings **26***a*. A spring **30** in the tube **18** beneath the valve **28** and resting on stop **32** traversing the tube **18** holds the valve **28** yieldably biased against a stop sleeve **34** tightly fitted in the tube **18** below openings **26***a*.

When the cartridge **22** becomes plugged as above mentioned, the pressure of oil on the valve **28** will cause the latter to open against the action of spring **30** and the oil is therefore by-passed around the element **22** to the tube **18**.

In accordance with the present invention, there is provided means for indicating, either audibly, visually or otherwise, when such plugged condition of the element **22** exists. Such improved signal structure is responsive in its operation directly to the movement of valve **28** away from the stop **34**.

Tube **18** is conventionally provided with a tight fitting plug **36** closing the uppermost end thereof and bearing tightly against a gasket **38** that seals the neck of container **12** when the tube **18** is drawn tight in the engine block **16**. Plug **36** may, therefore, be tapped to threadedly receive a tube **40** for mounting an elongated, rod-like conductor **42**. Insulating washers **44** and **46** separate the conductor **42** from the tube **40** and serve to rigidly mount the conductor pin **42** in the tube **40**.

A short, tubular conductor **48** is slidably mounted on the conductor **42** within the sleeve **34** and is held yieldably biased against the valve **28** of insulating material by a spring **50** coiled about the pin **42**. The vertically reciprocable conductor **48** is provided with a lateral ear **51** that is normally spaced above the metallic sleeve **34** when valve **28** is closed, as shown in Fig. 1, but which is adapted to engage the sleeve **34** upon downward movement of the valve **28** away from the sleeve **34** to an open position against the action of spring **30**. It is understood that when the valve **28** moves to the open position, the conductor **48** acts as a follower under the influence of the spring **50**.

The electrical signal may consist of any suitable device, and therefore a lamp **52** has been chosen for illustration and shown in series with the automobile battery **54** and with the pin **42**, the latter being provided with clamping nuts **56** for wire **58**. When the movable conductor **48** of the switching device is in engagement with the sleeve **34**, the circuit through signal **52** is closed from battery **54** through the signal **52**, wire **58**, conductors **42** and **48**, sleeve **34**, metallic tube **18**, and metallic plug **36** to ground.

The full-flow filter of Fig. 3 is designated by the numeral **100** and differs slightly from filter **10** in that it is mounted by means of a bracket **102**, and oil inlet

120 is at the side of container 112, tube 118 providing the oil outlet in the same manner as in filter 10. A metallic ball valve 128 is employed instead of the disc type valve 28 of insulating material, valve 128 being biased to the closed position by spring 130 in the tube 118. Openings 126 normally receive the oil from cartridge 122, but when the latter becomes clogged, the oil is by-passed into tube 118 through openings 126*a* and thence past valve 128. Conductor pin 142 is mounted precisely as above described relative to conductor pin 42, and reciprocable conductor 148, slidable on the pin 142, is biased against the valve 128 by a spring 150 coiled about the pin 142. Reciprocable conductor 148 is provided with a lateral ear 151 that extends into one of the openings 126*a* formed in stop or seat 134 for valve 128. Inasmuch as valve 128 is metallic, it is necessary to provide insulation 135 on the lowermost end of the pin 142 to separate the latter from the valve 128, and this element 135 comprises the only essential difference between the assembly of Fig. 1 and that of Fig. 3.

Here again, when valve 128 opens, the reciprocable conductor 148 will follow therewith by energy of spring 150 until the lateral ear 151 engages the stop 134 to establish a closed circuit through signaling means 152.

It is now apparent that a positive indication of inoperability of the filtering cartridge has been provided; that the same is universally adaptable for many types of filters; and that it can be applied to existing filters of the type herein set forth with only a slight modification of the component parts thereof. As long as the by-pass valves remain closed and the oil is being pumped through the filtering material of the cartridges, the circuit through the signaling means will remain open. The moment, however, that the oil is by-passed around the filtering cartridge by virtue of its becoming plugged and the by-pass valves open in response to the oil pressure, the switching means will operate to close the electric circuit for the signal and immediately notify the user of the engine that the cartridge should be replaced.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a signaling device adapted for insertion in a standard full flow oil filter having a container provided with a top, said container having an oil inlet and an oil outlet, filtering material in the container through which said oil is forced under pressure, an oil by-pass line connecting said inlet with said outlet, a valve seat in said by-pass, and a pressure-responsive valve in said seat, said valve normally being in engagement with the seat and shiftable in the direction of flow of the oil when the material becomes obstructed so as to force the oil through said by-pass, the improvement which comprises an electrical switch having a stationary contact mounted in the top and extending into the container, remote from said valve, there being provided electrical insulating material between the top and said contact, a movable element on said contact, said element being electrically conductive and normally in engagement with said valve, means insulating said movable element from said valve, resilient means between the top and said element for holding the latter biased toward the valve, and a metallic stop within the path of travel of the movable element for limiting the extent of movement of said element as the valve shifts to an open position and said resilient means moves the element against the stop.

2. In a signaling device adapted for insertion in a standard full flow of oil filter having a container provided with a top, said container having an oil inlet and an oil outlet, filtering material in the container through which said oil is forced under pressure, an oil by-pass line connecting said inlet with said outlet, a valve seat in said by-pass, and a pressure-responsive valve in said seat, said valve normally being in engagement with the seat and shiftable in the direction of flow of the oil when the material becomes obstructed so as to force the oil through said by-pass, an electrical signal, and an electric-circuit for said signal, the improvement which comprises a switch for closing the circuit to energize the signal when the valve is opened by oil flowing through said by-pass, said switch including a stationary conductor rod adapted for connection in series with the circuit, said rod being mounted on the top and extending into the container remote from said valve, there being provided electrical insulating material between the top and said stationary conductor, a movable conductor slidingly mounted on the rod and in electrical contact therewith, said movable conductor being normally in engagement with said value, means insulating said movable conductor from said valve, a spring on the rod and bearing against the conductor for holding the latter biased toward the valve, and a metallic stop within the path of travel of the movable conductor for limiting the extent of movement of said movable conductor as the valve shifts to the open position and said spring moves the movable conductor against the stop, said stop being adapted for connection in series with said circuit for closing the later to energize the signal when the movable conductor is against the stop.

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