April 24, 1934. L. CAMMEN 1,955,903

OIL PURIFYING APPARATUS

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Fig. 1.

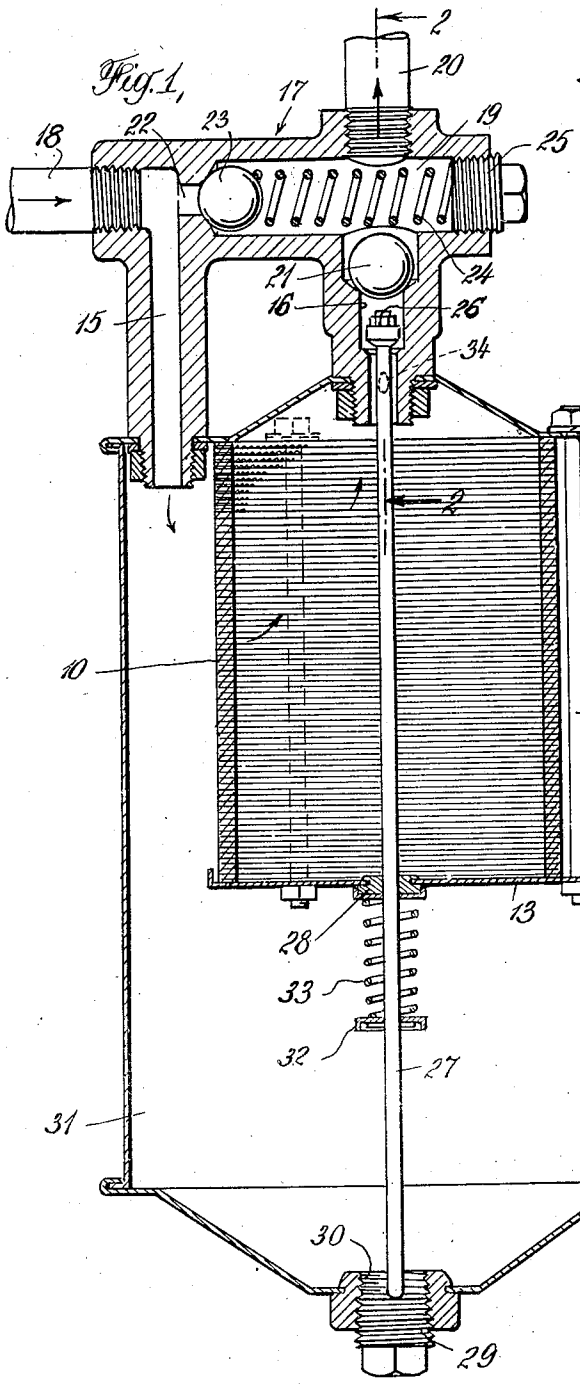
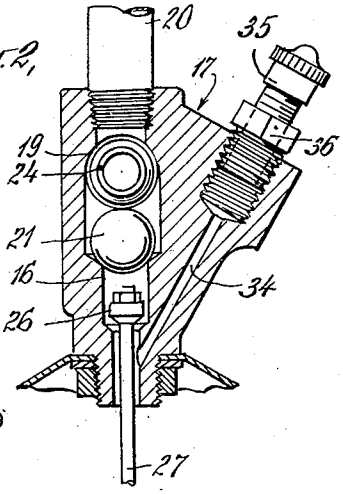


Fig. 2.



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OIL PURIFYING APPARATUS

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5 Claims. (Cl. 210—165)

This invention relates to apparatus for purifying the oil in a lubricating oil system of an internal combustion engine or the like. It has for its particular objects: First, the provision of a simple means for indicating whether or not such apparatus is properly functioning; and, second, means whereby the apparatus may be easily cleaned and blown out without removing it from its installed location, in the event the indicating means shows that cleaning is required for continued efficient operation.

Purification of the oil and the selective separation thereof from commingled sludges, suspensions, water and the like in lubricating oil systems may be readily obtained by employing a surface tension dialyzer element assembled in a closed container, as described in my copending application, Serial No. 638,329, filed October 18, 1932. Such a dialyzer element may be briefly described as a hollow cylindrical foraminous element of a substantial but uniform thickness between its concentric cylindrical walls, and wherein a myriad of uniform and substantially identical macroscopic (in contradistinction to microscopic) foramina provide a myriad of macroscopic continuous passages of substantially greater length than the greatest dimension of cross section thereof through which the lubricating oil flows as separate confined streams from one cylindrical surface of the element to the other, upon the application of a proper predetermined and regulated effective pressure—to the exclusion of the contaminants commingled therewith.

It is also pointed out in the aforementioned pending application that it is highly undesirable to permit sludge and other like material, selectively separated from the oil by the dialyzer element, to remain for long in contact with the surface of the dialyzer element interposed in the path of the contaminated oil to be purified. Nevertheless, it has been found after periods of continued use and in spite of vibration, that the surface of such an element tends to become coated with a layer of sludge which may include not only solid material, such as particles of dirt, metal chips, or carbon particles, but also heavy gummy substances. It has also been found that some of such material inevitably finds its way into the foramina of the element and tends to gradually clog it.

This tendency to form a coating upon the surface of the element and to clog the foramina takes place over different intervals, depending upon the length of time which the engine may have been run, the quality of the oil, the temperature and operating condition of the engine and bearings, etc.

Recognizing this difficulty, I provide, in accordance with the invention, a very simple but effective means whereby the operator of an engine or the like may ascertain from time to time the operating condition of such a dialyzer element, so that if it is not properly functioning the element may be cleaned and blown out without removing it from its installed location.

The indicating means of the invention preferably comprises an auxiliary passage communicating with that surface of the dialyzer element from which the purified oil is returned to the lubricating system. This auxiliary passage is adapted to be closed during normal operation by a screw cap or the like which, when removed, permits a free flow of oil from the passage only if the element is functioning properly. Oil will not flow freely, or at all, from the passage if the element is not functioning, due either to an accumulation of a layer of sludge on its operating surface or to clogging of the foramina.

Upon observing that oil does not flow from the auxiliary passage when the cap is removed, the element may be cleaned and blown out in its installed location by removing the drainage plug from the sludge chamber at the bottom of the container, as generally described in my aforementioned copending application, Serial No. 638,329, filed October 18, 1932. But, in accordance with the present invention, I provide a valve in the outlet port of the dialyzer element container, which becomes spring-seated upon removal of the drainage plug. When the spring-pressed valve is seated, it effectively prevents a flow of oil or an escape of fluid pressure back into the oil storage chamber, usually the crank case, when air pressure is supplied to the auxiliary indicating passage by means of a tire hose or the like. Thus, the auxiliary indicating passage serves a double purpose: First, for the indication of whether or not the element is functioning properly, and second, for the admission of air to the inner surface of the element for the purpose of blowing out and cleaning the foramina thereof, for removing sludge and the like which may have accumulated on the operating surface of the element, and for completely evacuating the container including the sludge chamber.

Replacement of the drainage plug in the container seals the sump or sludge chamber. It also lifts the valve from its seat against the

action of the spring to again permit of the normal flow of oil through the outlet port. Thus no direct manipulation of the valve is required, nor is it possible for vibration to cause the valve to become seated. After the drainage plug is replaced, the air hose may be removed from the auxiliary passage, the engine started (or the starter employed to turn it over), and the operator may then observe if the cleaning operation has been successful. If it has not, further blowing out may be required. If, however, the cleaning has been effective, the cap is replaced on the auxiliary passage and the element is ready to again perform its intended purpose.

For a more complete understanding of the invention, reference may be had to the following description of the preferred embodiment illustrated in the accompanying drawing, in which

Fig. 1 is an axial section through an oil purifying unit embodying this invention; and

Fig. 2 is a section through the outlet port and auxiliary passage of the unit along the line 2—2 of Fig. 1.

For purposes of illustration, the element 10 mounted in the container 11 may be the dialyzing element described in my copending application, Serial No. 638,329, filed October 18, 1932. However, the invention may be employed to equal advantage with other similar elements assembled in like containers.

The element 10 is supported between the top 12 of the container 11 and a bottom plate 13 by means of bolts or rods 14, which are tightened down to draw top 12 and plate 13 together to secure the necessary contiguity of the convolutions of the helically wound element 10. Sealed in the top 12 of the container 10 at two points are the respective inlet and outlet ports 15 and 16, which are a part of a fitting casting 17. The inlet 15 communicates with pipe 18 leading from the oil pump or other circulating means, whereby lubricating oil is introduced into container 11. The element 10 is arranged eccentrically in the container 11 to provide sufficient room for unobstructed flow of the oil from the inlet port 15. The interior surface of the element 10 communicates directly with the outlet port 16 through which the purified oil is normally discharged.

The inlet port 15 also communicates with by-pass 19, which in turn communicates with discharge pipe 20. A ball check valve 21 is arranged between port 16 and by-pass 19 and is normally held unseated by the pressure of the oil flowing from the inner surface of the element 10. By-pass 19 communicates through passage 22 with the inlet port 15. But passage 22 is normally closed by a ball valve 23 held in the seated position by a spring 24 which extends between the ball 23 and a plug 25, closing the end of by-pass 19. The spring 24 is adjusted to hold by-pass 19 closed when the element 10 is functioning properly, but when the element 10 becomes clogged the consequent increase in the pressure of the oil in the container 11 unseats ball 23 so that the oil is by-passed around the element 10 from inlet pipe 18 through the passage 22, by-pass 19 to the outlet pipe 20.

Located within outlet port 16 is a normally open valve 26 which is mounted on the end of a rod 27 which passes through a packing gland 28 in bottom plate 13. One end of the rod 27 normally rests upon the drain plug 29. The drain plug serves to close the outlet 30 of the sludge chamber or sump 31 of the container 11. A collar 32 is secured on rod 27 and between this collar and gland 28 is interposed a coiled spring 33 which tends to hold the valve 26 on its seat. When the drain plug 29 is removed from the outlet 30, the valve 26 becomes spring-pressed on its seat as will be understood.

Communicating with outlet port 16 at a point between valve 26 and the element 10, is an auxiliary passage 34 in the fitting 17, as shown in Fig. 2. This auxiliary passage 34 is normally closed by a removable cap 35 threaded upon the outer end of a nipple 36 secured in the outer end of passage 34. The threads on the outer end of the nipple are intended to accommodate the coupling of the usual tire air hose.

In operation, the oil is circulated by the oil pump of the engine through inlet pipe 18 and inlet port 15 into the container 11. The oil flows under pressure through the foramina of the element 10 to the exclusion of the contaminants originally commingled with the oil, which may include solid particles, oil sludge, water and the like.

Although it is intended that the contaminating masses collect in the sludge chamber or sump 31 of the container 11, by reason of the vibration of the engine or vehicle or having gradually settled by gravity, nevertheless some of this material, which is in the form of a gummy sludge or the like, may adhere to the operating surface of the element 10.

If the surface of the element 10 becomes coated with a layer of sludge, or if the foramina thereof become clogged, the element will no longer function properly. As clogging increases, the pressure of the oil accordingly builds up within container 11 until it overcomes spring 24 and unseats by-pass valve 23, so that contaminated oil is by-passed around the element 10 and flows directly back into the system through the outlet pipe 20, the outlet port 16 being closed against the ingress of contaminated oil by ball-check valve 21.

This by-passing of the oil is obviously undesirable. However, with the indicating device of this invention, the operator of the vehicle may readily ascertain whether or not the element is functioning properly. In order to so ascertain, it is only necessary to remove the cap 35 and, if the element 10 is functioning properly, oil will flow freely out of auxiliary passage 34. If the element 10 is clogged, little if any oil will flow out of passage 34, indicating that the by-pass valve 23 is open and contaminated oil is being returned to the crank case of the engine.

In order to remedy this condition, the operator may remove drain plug 29 and the sludge or the like collected in sump 31, together with the oil in container 11, flows out. Also, the removal of drain plug 29 releases rod 27 of valve 26 so that spring 33 forces the rod 27 downwardly to spring-press the valve 26 on its seat, thereby shutting off the interior of the element 10 from all outlets except the auxiliary passage 34. Then compressed air from a tire inflating hose, for example, may be supplied to the passage 34 and the sludge and other material adhering to the surface of element 10 or contained within the foramina are ejected and blown off by the air blast. The valve 26 closes the outlet port 16 against the leakage of air therethrough, the spring 23 being strong enough to hold the valve 26 on its seat against the air pressure.

Although inlet port 15 remains open, the oil circulating pump serves as a seal, so that air does not escape through inlet port 15. The sludge

ejected in this way from the element 10 is discharged through the outlet 30 of sump 31. After the element 10 has been cleaned in this fashion, plug 29 is replaced and as it is screwed in the outlet 30, it lifts rod 27 against the action of the spring and reopens valve 26. The cap 35 is then replaced on the indicating passage and the element is again ready for operation.

It will be seen that the arrangement of valve 26 eliminates the possibility that the operator will forget to open and close valves, since it is opened and closed automatically by replacement or removal of plug 29.

I claim:

1. In an oil purifying apparatus, the combination of an element adapted to selectively separate oil from contaminating masses commingled therewith, a closed container for said element, oil inlet and outlet ports in said container, a drainage port in said container, withdrawable means for closing said drainage port, means for indicating the operating condition of said element and the flow of oil therethrough, a spring-pressed valve arranged in said outlet port adapted to close the same, means including a rod actuating said valve for opening the valve against the action of the spring to open the outlet port when said means for closing the drainage port is in place, and to close the valve and the outlet port when said means for closing the drainage port is withdrawn.

2. In an oil purifying apparatus, the combination of an element adapted to selectively separate oil from contaminating masses commingled therewith, a closed container for said element and providing a sump, oil inlet and outlet ports in said container, a drainage port in said sump, a withdrawable plug for said drainage port, means for indicating the operating condition of said element and the flow of oil therethrough, a spring-pressed valve arranged in said outlet port adapted to close the same, a rod for actuating said valve extending through said element, means including said rod and said plug for opening said valve when the plug is inserted in the drainage port and for closing the valve when the plug is withdrawn.

3. In an oil purifying apparatus, the combination of a hollow cylindrical foraminous element adapted to selectively separate oil from contaminating masses commingled therewith, a closed container for said element and providing a sump, oil inlet and outlet ports in said container, a drainage port in said sump, a withdrawable plug for said drainage port, an auxiliary passage in said container communicating with the inner cylindrical surface of said element for indicating by the flow of oil therefrom the operating condition of said element and a flow of oil from its outer surface to its inner surface, a fitting for said passage adapted to enable the application of fluid pressure to the inner surface of the element, a spring-pressed valve arranged in said outlet port adapted to close the same, a rod for actuating said valve extending through the interior of said element, means including said rod and said drainage plug for opening the valve when the plug is inserted in the drainage port and for closing the valve when the plug is withdrawn, whereby when said plug is withdrawn and fluid pressure applied to the inner surface of said element, pressure is prevented from becoming released through the outlet port and becomes effective to evacuate the foramnia of the element, cleanse the surface of the element and evacuate the container including the sump, through the drainage port.

4. In an oil purifying apparatus, the combination of an element adapted to selectively separate oil from contaminating masses commingled therewith, a closed container for said element, oil inlet and outlet ports in said container, a drainage port in said container, means for closing said drainage port, a spring-pressed valve arranged in said outlet port adapted to close the same, means including a rod actuating said valve for opening the valve against the action of the spring to open the outlet port upon manipulation of the drainage port closing means to close the drainage port, and to close the valve when said means is manipulated to open the drainage port.

5. In an oil purifying apparatus, the combination of a hollow cylindrical foraminous element adapted to selectively separate oil from contaminating masses commingled therewith, a closed container for said element and providing a sump, oil inlet and outlet ports in said container, a drainage port for said sump, means for closing said drainage port, a spring-pressed valve arranged in said outlet port adapted to close the same, a rod for actuating said valve extending through the interior of said element, means including said rod for opening said valve against the action of the spring to open the outlet port upon manipulation of the drainage port closing means to close the drainage port, and to close the valve when said means is manipulated to open the drainage port.

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